The American Journal of Surgery

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EDITORIALS

THE SURGEON AND FORENSIC MEDICINE

IN the summer of 1934, the Editor and Publisher of this JOURNAL, after careful thought and consideration, decided to establish, as a constant feature, subject to the criticism of its subscribers and readers, a Department of Forensic Medicine.

The following reasons led them to the organization of this Department:

Almost 50 per cent of the cases reported to medical examiners for investigation are violent deaths, due to casualties, suicides and homicides.

These consist chiefly of highway accidents, homicides and suicides by cutting, stabbing, shooting, etc., injuries due to falls, burns, industrial accidents, etc.

Many of these individuals come to the attention of surgeons during life, and the lesions found, such as the various types of skull fracture and traumatic cerebral hemorrhage; rupture of solid and hollow viscera; fractures of extremities, ribs and spine; sudden death from pulmonary embolism, and infected wounds of extremities and body, are of surgical interest.

In addition, in view of the supposed relationship of trauma to cancer, the involved medicolegal aspects of single and repeated injuries or sustained irritation such as might occur in certain occupations, also comes under the jurisdiction of medical examiners for investigation.

As the number of autopsies performed by medical examiners greatly exceeds those obtained by permission in hospitals and medical centers, and as at least one half of them are of surgical interest, it was felt that one of the greatest sources for securing accurate data of surgical interest is being lost or of little practical use, especially since the attendance at medicolegal autopsies is usually small.

Furthermore, medical examiners are often so busy with their daily routine, investigations which must be made at

any time of day or night, constant calls to the various courts with the consequent waste of time, etc., that it becomes increasingly difficult for them to report, in medical and surgical literature, many of their important observations.

Likewise, as most medical examiners are essentially pathologists or should be (providing the politicians acquiesce), when they do find time to report their cases, publish them in some scientific journal of small or limited circulation, too often phrased in obscure language, where its practical use may be entirely lost sight of. Its poorly selected title often makes classification in the Index Medicus difficult.

Besides, it should be recalled that in the United States there are no journals devoted to Forensic Medicine, especially that part dealing with the accurate establishment of the cause of death through pathological observations. It is true a few journals do allot a small space to Legal Medicine, but they carry, chiefly, obtuse subjects, as for example, the physician and psychiatrist in the prevention of delinquency; pre-delinquent and delinquent children; juvenile courts; the various phases of the compensation racket; how a physician should behave in court; the dull and too often assinine "Hypothetical Question" which is as sacred to lawyers as "Filibustering" is to senators; the archaic "Precedence" in which a lay referee decides that leucemia came from a bump on the shin, etc.; ad infinitum.

It will be readily seen, therefore, that such a Department is not alone of benefit to the Surgeons—providing, of course, it can continue to give them anatomical facts directly bearing on their work, but it also gives an opportunity to men performing medicolegal autopsies to publish quickly short articles and case reports of practical interest, and teaches them to write in a short concise manner.

It was decided, therefore, by way of experiment, to devote the October, 1934 issue of the Journal entirely to Forensic Medicine, paying special attention to having concise, plain articles of interest to surgeons written by pathologists. The number contained thirty papers, most of them written by men who are daily performing medicolegal autopsies and many by well-known pathologists. This number, I believe, was a success, and it is hoped did not tire the readers.

In succeeding numbers, we have planned to have one, two or three articles or case reports under this department.

It should be remembered that the main purpose of this venture would be rendered void if it was for a moment thought by any of the readers that an attempt was being made to force upon them a subject of little use. We do not want to create an impression that we are attempting to convert a surgical journal into one on forensic medicine. The articles appearing each month, therefore, must be necessarily limited in number and as time goes on will undoubtedly be more and more carefully selected, especially as to their practical importance to the surgeon. There seems to be no difficulty in limiting the papers at the present time, since it should be recalled that the number of men in this country performing good medicolegal autopsies is very limited. We must realize that forensic medicine in this country, in spite of the highest criminal record of any civilized nation, is at an exceedingly low level. These conditions are not due to the medical profession or the medical schools but are directly attributable to the politician—since, if you train men for medical examiners' work, there is no assurance that the politician will appoint them.

While we feel it is better that the merit of a paper be finally judged by the reader and not the editor, it may be of interest to call attention to some of the articles that have appeared in the issues of the journal so far.

The editorial of Norris, Chief Medical Examiner of New York City, in the October issue needs no comment. The report of Vance on 90 cases of thrombosis

of the lower extremity with death from pulmonary embolism certainly represents the largest individual report on this condition; it is not a review of literature. The perennial argumentative controversy on the existence of status lymphaticus is authoritatively discussed by Symmers. Wounds in civil life are described by such experts as Gonzales, Helpern and others. The relation of trauma and malignancy is authoritative from Knox who has one of the best reviews on this important subject. Intracranial hemorrhages and head injuries have been discussed by Leary, Swift, Ayer and others. A study of the Workmens' Compensation Insurance by the pathologist Bell and relation of organic disease to injury by St. George is definitely of interest to surgeons doing compensation work as is the evaluation of accidental injuries by Kessler. Resuscitation by Coryllos and Murphy, electric shock by Williams, and chloroform and ether deaths by Gettler, are all authoritative.

This issue contains two articles to which I would call especial attention.

J. Edgar Hoover, the well-known director of the Division of Investigation of the United States Department of Justice, a man whose indefatigable work under the direction of Attorney General Cummings has done so much to eradicate the gangster, bank robber and kidnapper, and to keep his Department free from politics, discusses the "Responsibility of the Surgeon in Plastic Surgery of Criminals." In this connection attention is also called to the article "Changing of Fingerprints" by Updegraff in the December, 1934 issue of the JOURNAL.

H. J. Anslinger, Commissioner of Narcotics, Bureau of Narcotics, Treasury Department, analyzes "The Narcotic Problem in its Relations to Physicians and Surgeons."

The JOURNAL wishes to thank these authorities for their whole-hearted cooperation.

Expressions of approval or criticism of this attempt will be gratefully received by the editors and publishers.

H. S. MARTLAND.

LEWIS STEPHEN PILCHER

A QUARTER of a century ago we sat during a lecture delivered by the late Lewis Stephen Pilcher. He was, then, a man no longer young. His brilliant son, Paul, who died early in his career, did us many kindly turns. Upon undertaking the editorship of this Journal Dr. Pilcher was the first one to write us a friendly and personal note of congratulation. His friendship with Paul Hoeber goes back to the early days of this century.

We knew he was failing in health. A month before his death we sat one afternoon with his son, James Taft Pilcher, who so ably has conducted the *Annals of Surgery* during the past few years, and he told us his father would retire the first of the year. He died on December 24, 1934, in his ninetieth year.

Lewis Stephen Pilcher was born on July 28, 1845. His father was a Methodist clergyman on the frontier of Michigan. Lewis entered the University of Michigan when only thirteen years of age. He took his bachelor's degree at seventeen and his master's degree a year later. At the time of his death he was the youngest to have matriculated and to have graduated at that University.

He then entered medical school. His studies were interrupted by the Civil War and he did not get his degree until 1866.

Dr. Pilcher started practice in the rural parts of Michigan, combining teaching school with his professional duties.

He did postgraduate work in New York, and was appointed Assistant Surgeon in the U. S. Navy. He followed the sea for five years, when he contracted yellow fever at Havana. He entered private practice in Brooklyn in 1872. There he opened a class in anatomy and, in 1878, this grew into the Brooklyn Anatomical and Surgical Society. The Transactions were published in a

volume (*Annals of the Anatomical and Surgical Society*, 1878–9). The succeeding volumes appeared as a monthly publication under Pilcher's editorship (*Annals of Anatomy and Surgery*). He continued this work until 1884 when he went to Europe to study surgery. Upon his return the publication was continued as the *Annals of Surgery* (1885). Historically this is of interest because it was the first surgical journal in the English language. He continuously edited the *Annals of Surgery* for fifty-one years.

His career was full of honors bestowed upon him. He held many important positions. He taught in the Long Island College of Medicine. He was in his time President of the Medical Society of the County of Kings and of the American Surgical Association. The semicentennial (1916) of his practice was celebrated by a public banquet, at which he was given a gold medal.

His writings were many. A few years ago he wrote an autobiography, "A Surgical Pilgrim's Progress." It affords good reading.

Dr. Pilcher was a collector of old and rare medical books. His collection of incunabula was considerable and of great value. He left this library to his alma mater, the University of Michigan.

His was a useful and full life. He was widely known as a public-spirited citizen, stood in the front ranks as a surgeon, and was the undisputed dean of American medical editors.

We deplore his passing. His name will be kept alive in historical writings. A grand old man is no more.

T. S. W.

FRANKLIN H. MARTIN

DR. FRANKLIN H. MARTIN, in his seventy-eighth year, died on March 7, 1935, of a heart attack, in Phoenix, Arizona.

Dr. Martin went to Phoenix as a winter visitor and on February 27th suffered an attack of coronary thrombosis.

At the time of his death he was director-general of the American College of Surgeons. In addition, he was chairman of the board of the Gorgas Institute of Tropical and Preventive Medicine. As chairman of the General Medical Board of the National Defense Council during the World War he was instrumental in enlisting thousands of medical officers. For this work President Wilson commended him in 1918.

He founded *Surgery, Gynecology and Obstetrics*, of which he was editor-in-chief. In 1910, he organized the clinic of the congress of the American College of Surgeons, and in 1913 organized the College of Surgeons. He served as president of the College in 1928 and 1929.

During the World War he was a colonel in the Army Medical Corps, and since 1925 he has been honorary advisor to the United States Army Industrial College. He was a former trustee of Northwestern University.

Recently he wrote "The Joy of Living—an Autobiography" which has enjoyed a large circulation. He received the Distinguished Service Medal from the United States, the Companion Order of St. Michael and St. George from Great Britain, and the rank of Commander of the Order of the Crown of Italy.

In Dr. Martin's death American Surgery has lost one of its foremost surgeons, its most able organizer, and a good citizen.

T. S. W.

Subscribers to The American Journal of Surgery *visiting New York City are invited to make the office of the publishers (Paul B. Hoeber, Inc., 76 Fifth Avenue, New York) their headquarters. Mail, packages or bundles may be addressed in our care. Hotel reservations will gladly be made for those advising us in advance; kindly notify us in detail as to requirements and prices. List of operations in New York hospitals on file in our office daily.*

PRESENT-DAY TREATMENT OF MALIGNANT TUMORS

EDITOR: EDWARD M. LIVINGSTON, M.D.

III. CANCER OF THE GENITOURINARY TRACT
A SYMPOSIUM

SUPRAPUBIC CYSTOTOMY WITH EXCISION AND IRRADIATION

IN THE TREATMENT OF MALIGNANT TUMORS OF THE BLADDER

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TWO procedures will be described under this caption, suprapubic cystotomy with the implantation of radon seeds, and the more radical operation of excision of the tumor.

SUPRAPUBIC CYSTOTOMY WITH IMPLANTATION OF RADON SEEDS

The object of this operation is to obtain a good exposure of the tumor and eradicate the growth in one treatment by the implantation of radium seeds. Suprapubic cystotomy is preferable to cystoscopic radiation for the following reasons.

(1) It is difficult to ascertain cystoscopically the exact extent and character of the neoplasm.

(2) The degree of infiltration of the bladder wall can only be definitely determined by a suprapubic approach.

(3) The tumor can be perfectly visualized affording accuracy in the distribution of the radium seeds.

OPERATIVE TECHNIQUE:

1. The bladder is thoroughly irrigated and then completely emptied. This step is important to prevent spilling of the bladder contents resulting in contamination of the wound, and also diminishes the possibility of implantation growths in the abdominal wall from broken off tumor cells.

2. If there are no contraindications, spinal anesthesia is to be preferred as the relaxation of the abdominal muscles greatly facilitates the exposure. The patient is then placed in the Trendelenburg position.

3. A median vertical incision is made extending from the symphysis upwards, the length of the incision depending on various factors such as the thickness of the abdominal wall, depth of the bladder, etc. The recti muscles are separated exposing the bladder with the overlying peritoneum. Despite the fact that the bladder is empty, it is readily recognized by the plexus of veins on its surface. From this step on, the procedure will depend on whether or not the bladder is to be mobilized. For radon implantation mobilization may not be necessary at all, especially in thin individuals. In heavy subjects, when the growth is situated near the neck or on the floor of the bladder a certain degree of

mobilization may be required to obtain a proper exposure.

We will first consider cystotomy without mobilization, and in the operation of cystotomy with resection of the tumor describe the technique of mobilization.

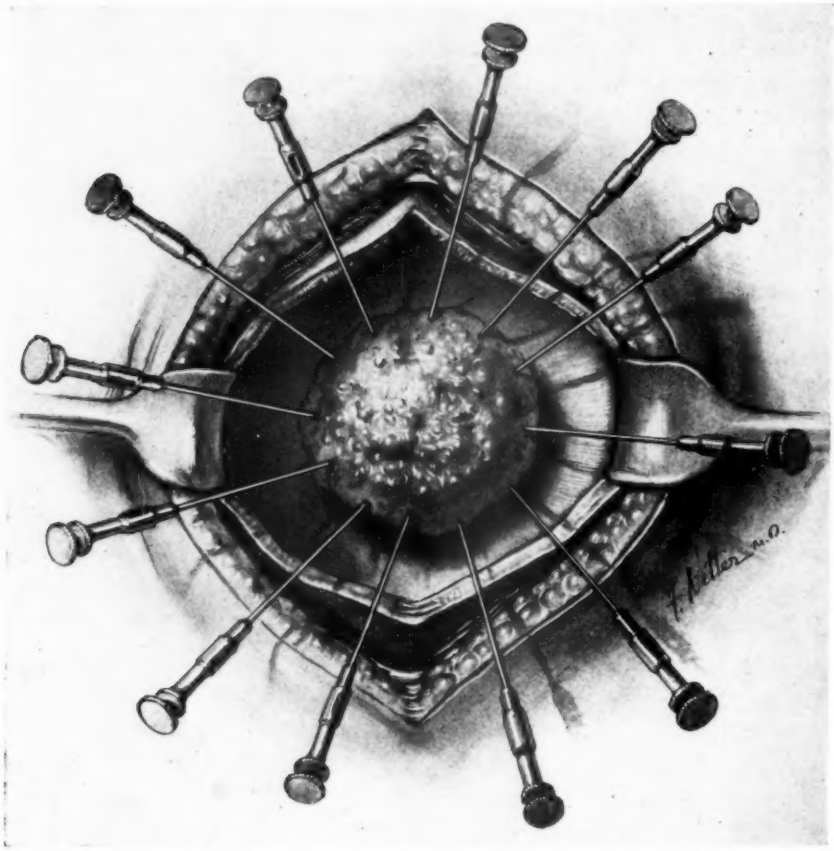

Fig. 1. Radium introducers inserted in periphery of growth. Second row of needles is placed mesially to first.

4. After exposing the bladder the overlying peritoneum is sponged upwards from the vault. Self-retaining retractors are now inserted, the abdominal wall widely retracted and the bladder isolated by careful packing off on all sides with large moist pads. This step is very essential to avoid contamination of the perivesical tissues.

5. The emptied bladder is grasped in the median line of the vault with two blunt clamps of the Carmalt type (clamps with biting edges are to be avoided) and with the endotherm needle is opened in the midline from the vault downwards as far as necessary to obtain a good exposure. Any fluid remaining in the bladder is aspirated by suction. Bladder retractors with long blades preferably of the loop wire type are now introduced and the growth brought into view. Visualization may be facilitated by the curved Cameron light which is introduced into the bladder. If specimens are desired for biopsy studies, they should be removed with an endotherm electrode. The proliferating part of the growth is removed with the endotherm electrode and the base lightly coagulated. If the growth is of the flat ulcerating type, very little coagulation will be required—just a light surface searing. The base of the bladder is now ready for the implantation of radon seeds. Before proceeding with the introduction of the seeds, the growth is palpated for evidences of infiltration. It may be necessary to have an assistant insert a finger in the vagina or rectum so as to obtain more accurate information as to the degree of induration

and infiltration of the region to be implanted. We employ platinum radon nonremovable seeds of a strength of 2½ mc. three or four rows of seeds may have to be implanted, the seeds placed approximately 1 cm. apart. In this way the whole field is

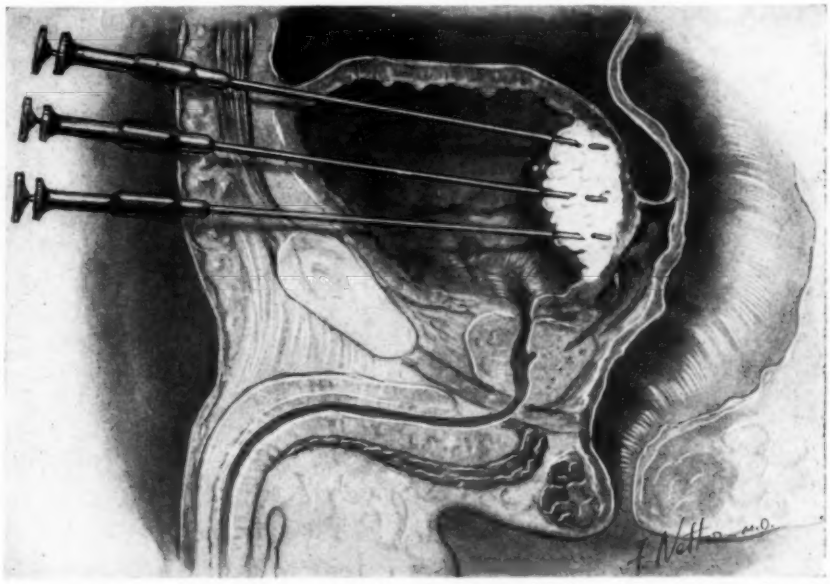

Fig. 2. Cross section of tumor showing depth to which needles are introduced.

each. Special rigid suprapubic introducers are used which contain a slot into which the seed is introduced. By plunging the stillette down, the seed is imbedded in the growth. A number (at least twelve) of these radon introducers or needles should be available. The depth to which the needle is inserted requires considerable judgment and experience, the average depth being about 1 cm. If the growth is on the floor of the bladder above the prostate, the needles may be introduced deeper than in growths on the lateral wall or vault. If the tumor is of the ulcerative type with a thin bladder wall, too deep an insertion of the needles may subsequently result in a perforation.

6. Distribution of seeds. The number of seeds to be implanted will depend on the size of the growth. First a row of seed introducers is implanted in the extreme margin of the tumor in order to destroy potential malignant cells beyond the growth (Figs. 1 & 2). These introducers are then left in situ until the second line of needles placed mesially to the first has been inserted into the growth. In large tumors, accurately covered, whereas if the needles were removed immediately on introducing the seed we could not be certain as to the exact area covered. The number of seeds introduced will of course depend on the size of the neoplasm. In large tumors, as many as thirty to forty seeds have been inserted delivering a dosage of 4000 to 6000 mc. hr. gamma radiation.

7. If the bladder wall has been opened with a scalpel, the cut edges are lightly seared with the endotherm electrode after removing all the clamps attached to the bladder incision. This step is taken to protect the bladder incision from possible cell implants.

8. The table is straightened out from the Trendelenburg position and the wound cavity and the bladder with all the original packings still in place is flooded with 50 per cent alcohol for about five minutes to destroy any broken off tumor cells. The alcohol is then aspirated by suction after which the protective packings are removed, fresh ones are inserted and all the instruments used up to this time are discarded for a fresh set. The bladder is

sutured with two layers of catgut allowing space for a medium sized tube or Pezzer catheter in the lower angle of the wound.

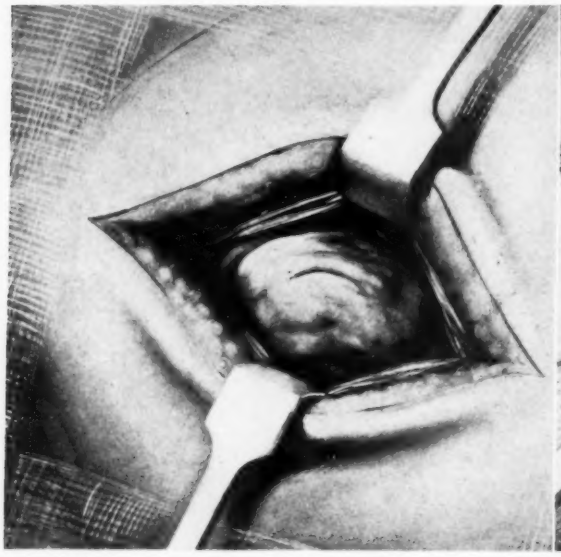

Fig. 3. Wide extraperitoneal suprapubic exposure of bladder in moderate Trendelenburg position after irrigation and emptying of organ.

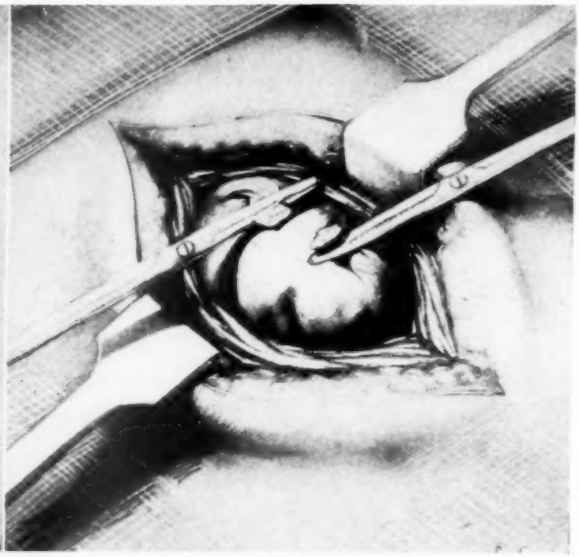

Fig. 4. Liberation of bladder from its bed. Division of urachus. Bladder pulled out of abdomen.

The first layer with plain catgut is a continuous inversion stitch which enfolds the bladder, while the second is an interrupted Lembert suture of fine chromic gut. The packings are then removed and the bladder suspended to the rectus sheath with a chromic suture on either side, after which gauze or rubber dam drains are placed above and below the tube. The parietal wound is closed in layers using interrupted plain gut for the muscle and chromic for the fascia.

General Considerations:

Case Selection. In infiltrating carcinoma, especially large growths involving the neck of the bladder and trigone which are not resectable because of their extent, or the patient's poor condition. For large multiple bladder tumors.

For tumors that have recurred after resection or cystoscopic radon treatment. To control inoperable growths. Tumors occupying the base of the bladder and trigone will constitute by far the greater percentage for which this method is applicable, as tumors on the vault or lateral walls are generally suitable for resection.

Since many of these cases have secondary renal involvement, it is essential to make a careful study of functional and mechanical renal factors which postoperatively may cause serious complications. Besides blood chemistry determinations, intravenous urography studies should be routinely made, as the ureter is not infrequently compromised by the tumor resulting in hydronephrosis with infection or destruction of the kidney.

The bladder which is generally infected should be irrigated frequently with acriflavine 1:4000 and the urine rendered acid by acidifiers such as ammonium chloride and acid sodium phosphate supplemented by dietary measures (acid ash diet). Anemia and debility should be treated, preferably by small transfusions. Intravenous glucose injections are of great aid in improving renal function.

Operative Aids. Spinal anesthesia, the Trendelenburg position, and a continuous intravenous glucose drip.

Postoperative Care. It is important that the suprapubic drainage functions well. Blood clots plugging the tube may cause the suture line to give way. For the first

few days the drainage should empty into a bottle placed in the bed between the patient's legs instead of leading to a receptacle on the floor or bedside, as this creates too much suction resulting in hemorrhage. For the first twenty-four hours intravenous glucose injections are indicated, and to combat shock a transfusion may be required. The drains are gradually shortened after the fourth day and the suprapubic tube removed about the tenth day. Some form of suprapubic cup is then applied or an indwelling urethral catheter inserted. The urine should be kept acid by diet and acidifiers, and if there is a tendency for incrustations to form in the bladder, it is lavaged daily with phosphoric acid 1:1000 solution.

Some of the radon seeds are passed in the urine at intervals varying between one and three weeks. Others as demonstrated radiographically may remain in situ indefinitely. Bladder irritability due to the radium reaction generally does not occur until ten to fourteen days after operation, and may last four to six weeks. During this period, urinary sedatives such as hyoscyamus, belladonna and santol oil should be freely used.

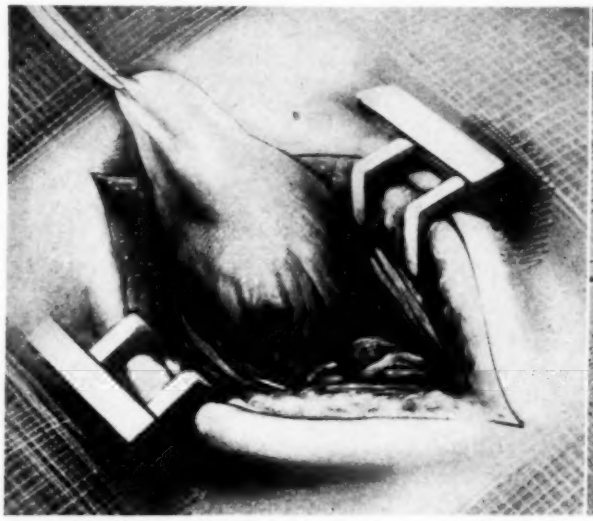

Fig. 5. Bladder completely freed by sponging off peritoneum and perivesical non-adherent fat. Posterior surface of bladder presenting as apex is drawn over pubes.

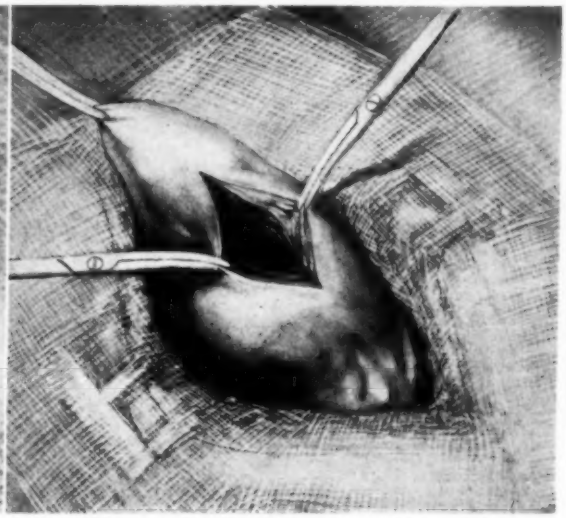

Fig. 6. Heavy gauze pads surround the bladder and carefully protect all parts of wound. Incision through posterior wall of bladder. Edges of incision seized with curved blunt forceps (Carmalt type).

Complications of Radium Treatment. Renal complications are the most prevalent, resulting in infection of the kidney, occasionally going on to destruction of the organ. Stricture of the ureter may occasionally occur. Secondary stone formation or phosphatic encrustations of the base of the tumor, may occasion considerable vesical distress. Too intensive radiation may result in vesicorectal fistula.

End-results in Radon.

Prior to 1930, 81 cases were treated with radium seeds. The mortality was 13 per cent. This rather high mortality may be accounted for by the fact that many of these patients were in a considerably debilitated condition. Another contributing factor may be ascribed to too extensive a mobilization of the bladder. In recent years we have not resorted to mobilization to such a degree as formerly, resulting in a considerable diminution in mortality. Of this group of 81 cases, 7 could not be followed up. Ten cases were cured for five years and over, that is 16 per cent of those surviving operation and followed up. Four cases were apparently cured less than five years making 14 apparently cured, or 22 per cent of those surviving operation and not lost to follow up. [Beer: "Tumors of the Urinary Bladder."]

SUPRAPUBIC CYSTOTOMY WITH PARTIAL RESECTION OF THE BLADDER

The preliminary steps of the operation are the same as previously described for the implantation of radon seeds. Having decided upon a resection the next step is the extraperitoneal mobilization of the bladder. This and the subsequent steps of the operation is the technique described by Beer in 1921 and which we have consistently followed since then.

Operative Technique:

Extraperitoneal mobilization. After exposing the bladder the peritoneal reflexion is bluntly sponged upwards towards the dome of the bladder. If the tumor is situated on the posterior wall of the bladder invading the peritoneal surface, the mobilization laterally is not proceeded with until the peritoneum has been opened and the posterior wall of the bladder examined. If the serosa appears to be involved, the peritoneal surface is left attached to the bladder wall by lateral incisions on either side and subsequently removed with the tumor. The peritoneum is then stripped off into the pouch of Douglas so that it can be sutured to the anterior parietal peritoneum thus closing the peritoneal cavity. If the tumor is not situated on the posterior wall the typical mobilization is immediately carried out. The perivesical fat on either side of the bladder near the vault is bluntly dissected exposing the urachus. The urachus is doubly clamped and cut between. The upper end is ligated while the lower end with clamp attached is used as a tractor to help in freeing the bladder. The perivesical fat on either side of the bladder is bluntly separated from the lateral walls of the bladder. The peritoneum attached to the posterior wall of the bladder is now identified and gently stripped off the bladder preferably by sponging. This part of the mobilization generally presents no difficulty if the peritoneum is not involved and the stripping posteriorly is proceeded with down to the region of the ureters.

Occasionally the peritoneum may inadvertently be opened in one or a few places. These openings should be utilized for palpating the bladder and pelvis and also the liver for metastases, after which the rents are sutured. The lateral separation of the bladder requires the ligation of several of the vessels supplying the bladder wall. As the mobilization proceeds, these vessels are exposed and ligated. It is important to avoid if possible too extensive a mobilization of both sides of the bladder. By so doing one or two of the vesical arteries may be preserved and thus prevent devascularization of the bladder wall which may produce necrosis. Since the majority of resectable growths are situated laterally, the side opposite to the tumor does not have to be exposed as deeply as the involved side, thus preserving the inferior vesical artery. The bladder on the side of the tumor is mobilized sufficiently to allow of a good exposure beyond the growth. By lifting the bladder forward over the symphysis and by bluntly dissecting with sponges, the bladder can usually be exposed down to the trigone. If cystoscopy and intravenous urography have demonstrated that the ureter is involved by the growth and may have to be sacrificed, it is well at this stage to expose the ureter and pass a temporary ligature around it. Since both vasa deferentia are readily exposed in this dissection, it is advisable in elderly patients to ligate and divide them, thus diminishing the incidence of postoperative epididymitis. The bladder having been mobilized, the growth is palpated bimanually to determine its extent and degree of induration.

Self-retaining retractors are now introduced and the bladder carefully packed off with large moist pads, completely covering the entire exposed operative field. The bladder is grasped with two blunt forceps in the region of the tumor and is opened with the endotherm needle. The incision in the bladder wall will depend upon the site of the tumor (as demonstrated by cystoscopy) and will be either

in the median line or laterally on the anterior or posterior wall, naturally avoiding impinging on the tumor. As soon as the bladder is opened, it is aspirated by suction to empty it completely of its contents so as to avoid any spilling. The incision in the bladder wall is then lengthened to permit complete visualization of the interior. As the incision is lengthened, the cut bladder wall is grasped with blunt forceps and as soon as the growth is exposed it is thoroughly fulgurated. (Figs. 3 to 12.) With the needle electrode, the incision in the bladder wall is gradually enlarged going well beyond the limits of the growth or any area of induration around the growth. If the ureter is involved a reimplantation will have to be done. The ureter having already been exposed has a loop ligature around it for identification and traction. The ureter should be left attached to the growth until the resection has been completed. The ureter should then be cut across about 1 to 2 cm. above the bladder wall removing the tumor with its pedicle of ureter attached in one piece.

The table is now lowered and the entire wound and bladder cavity flooded with 50 per cent alcohol so as to destroy any potential cell implants. At the end of five minutes the alcohol is aspirated and all the pads and packings removed. All retractors and instruments used during the operation are now discarded for a fresh set. The bladder wall is sutured as described previously. If an implantation of the ureter is to be done, a stab incision is made on the posterior wall of the bladder into which about an inch of ureter is pulled through and allowed to protrude into the bladder cavity. Another method of reimplanting consists of splitting the cut end of the ureter longitudinally for about 1 cm. This cut end is then drawn into the bladder through a small incision on its posterior surface. The split end of the ureter is fixed within the bladder by fine mattress suture of chromic gut. With either method of transplantation, as an additional safety measure the ureter is fixed to the outside of the bladder at its point of entrance with chromic sutures.

After allowing for suprapubic drainage, the bladder is sutured in two layers and the pelvis drained with rubber dam drains placed anteriorly and posteriorly to the bladder. One should avoid placing drains alongside the site of the neostomy. The

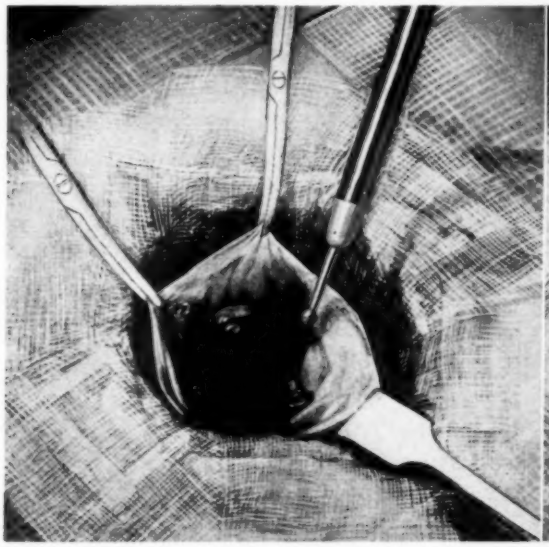

Fig. 7. Incision in bladder has been gradually enlarged exposing numerous papillary tumors. With cautery they are burned to a crisp and their bases destroyed.

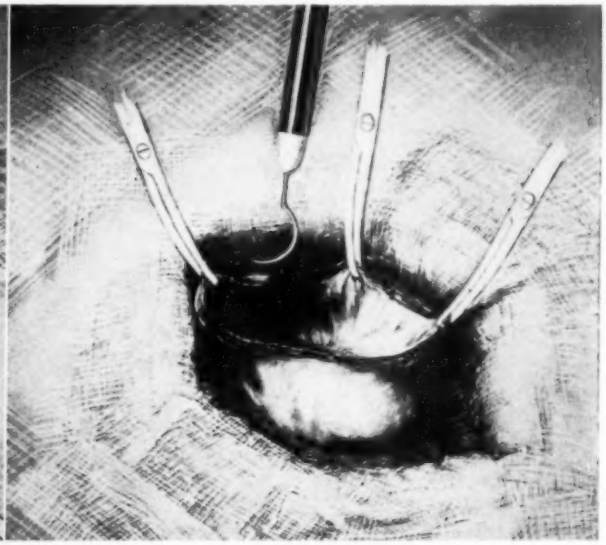

Fig. 8. Wound in bladder is carefully seared, each clamp being removed as it is reached. Then, all clamps off, patient being lowered, wound (including bladder) is completely filled with alcohol.

abdominal wall is closed in layer sutures after fixing the bladder to the rectus sheath with chromic sutures.

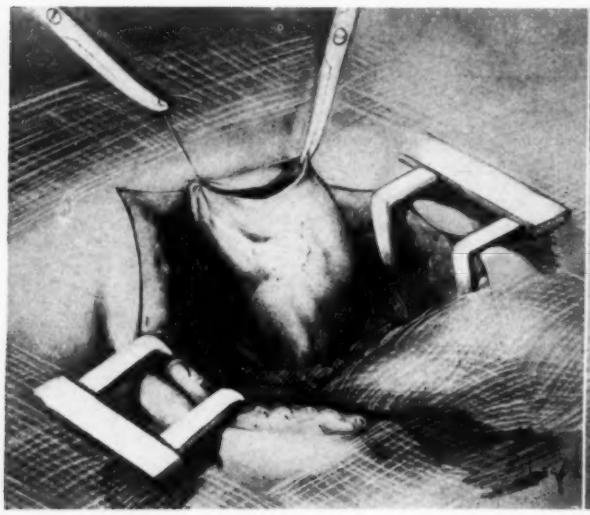

Fig. 9. After removal of soiled gauze and of alcohol, charred incision in bladder is inverted with two layers of sutures, leaving adequate opening for tube drainage.

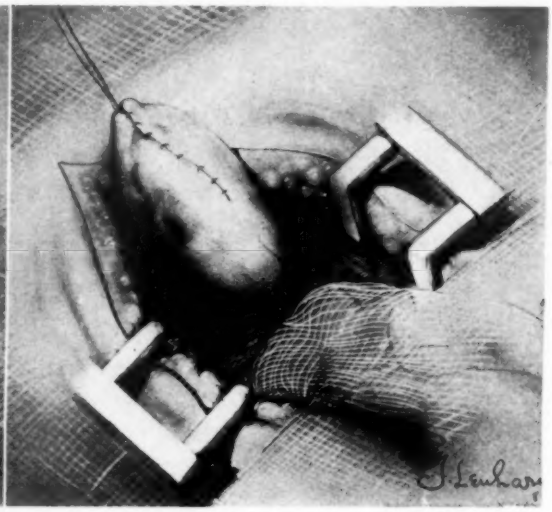

Fig. 10. Outer layer of chromic catgut closing incision in posterior wall before replacing organ in its bed.

If intravenous urography has demonstrated a functionless hydronephrotic kidney, nephrectomy may be indicated. We are not in favor, as has been practiced in some clinics, of simply tying off the lower end of the cut ureter and relying on the organ to undergo an aseptic atrophy. The results of ureteral implantation as demonstrated by intravenous urography have been most gratifying and we therefore prefer a neostomy to any other procedure.

Metastatic involvement of the pelvic glands seems to be very infrequent. In only a few instances where glands were removed at operation did they prove to be carcinomatous.

General Considerations:

All the measures discussed previously apply likewise to this type of operation. Resection of the bladder wall is indicated in all types of infiltrating growths situated in such a position as to make resection feasible. A good deal, of course, will depend upon the condition of the patient. Resection is a rather extensive operation and is therefore contraindicated in patients debilitated either by disease or renal infection. We are firmly convinced that the results of resection in suitable cases are so much better than suprapubic radon treatment that we consider it the method of choice.

End-results:

There were 17 postoperative deaths, a mortality of 25 per cent plus in 67 cases of resection of the bladder wall. Where a neostomy was done, the mortality was 21 per cent and in those cases without neostomy it was 27 per cent. Of the 67 cases, 3 were not followed and 1 case is too recent. These with the 17 deaths leave 46 patients followed one to sixteen years. Of these 14 cases (30 per cent) were well five years or more and 9 were apparently cured for periods of less than five years (2 for four years, 1 for three years, 3 for two years and 3 for one plus years). This group of 9 cases plus the 14 cured over five years, gives 23 cases apparently cured for one to sixteen years or 50 per cent of the 46 cases surviving operation and followed. Of the whole group of 67 resected infiltrating carcinomata, 34 per cent were therefore apparently cured by the above described technique.

Recurrences were present in at least 15 cases (32 per cent) and 8 more patients died eventually of carcinoma, making 23 failures. A number of cases in this group were re-operations following operation at another institution. [Beer: "Tumors of the Urinary Bladder."]

TOTAL CYSTECTOMY AND PARTIAL PROSTATECTOMY

This operative procedure has as its objective the complete extirpation of the urinary bladder containing the growth, with part of the prostate. The disposition of the ureters offers one of the main problems. The urine may be deflected by various means: lumbar nephrostomy, sigmoidal transplantation and by cutaneous ureterostomy. If the last procedure is carried out the entire operation may be performed in one stage. If the ureters are to be implanted in the sigmoid a two step operation is required, first transplanting the ureters and subsequently removing the bladder. Since sigmoidal transplantation has a very definite mortality in itself, and in view of the fact that the kidneys are so frequently compromised by the extensive growths requiring cystectomy, thus adding an additional hazard, our preference has been the one step operation with cutaneous neostomy. Some surgeons prefer a lumbar nephrostomy which can be done with the cystectomy in one stage or as a preliminary step.

Operative Technique:

The patient is placed in high Trendelenburg position. The bladder is first irrigated and then completely emptied. A median suprapubic incision is made extending from the symphysis to the umbilicus. Although the operation is preferably done extraperitoneally, it is often advisable to open the peritoneum so as to explore for possible metastases. If the peritoneum over the posterior wall of the bladder appears to be involved, it should be left attached to the bladder wall and removed with the bladder. If this is done the parietal peritoneum is first sutured to the peeled off peritoneum in Douglas's pouch to close off the peritoneal cavity from contamination. Self-retaining retractors are now inserted so as to widen the incision as much as possible. Before proceeding with the mobilization of the bladder, a careful palpatory examination should be made for evidences of infiltration and extent of the neoplasm. If doubt exists as to whether a total cystectomy is justifiable, the bladder should be opened for further confirmatory evidence. Should we then decide upon a cystectomy the bladder is carefully sutured so as to avoid any spilling of its contents. The bladder is now freely mobilized. It is freed from its fatty and peritoneal attachments by blunt dissection on either side of the urachus. The urachus is readily visualized at the vault of the bladder, double clamped and cut. The clamp on the bladder side is used as a tractor. The peritoneum attached to the posterior surface of the bladder is now identified and if not involved is stripped off the bladder preferably by sponging. As the bladder is gradually freed laterally and posteriorly, the vesical arteries and veins which are brought into view are doubly ligated and cut and the bladder is delivered over the symphysis. As more and more of the bladder is pedicled on its base, the seminal vesicles and the vasa deferentia as they cross the ureters are exposed, the vasa are doubly ligated and cut. At this point the ureters are exposed and separated from their attachments and followed down as close as possible to their entrance into the bladder. A temporary ligature is applied around each ureter to prevent leakage after section of the ureter. The vesical end of the ureter having been ligated as close to the bladder as possible is then divided. The cut ureters are left in situ with the temporary ligatures attached until the extirpation of the bladder has been completed.

The mobilization of the bladder is completed by incising the anterior attachments of the prostate behind the symphysis. Bluntly the prostate is freed laterally and posteriorly from the rectum. The bladder with the seminal vesicles attached and the prostate are now entirely free. There is likely to be considerable oozing from the periprostatic plexus which is

readily controlled by transfixion sutures. The prostate is now grasped with two bullet forceps, one on either side and

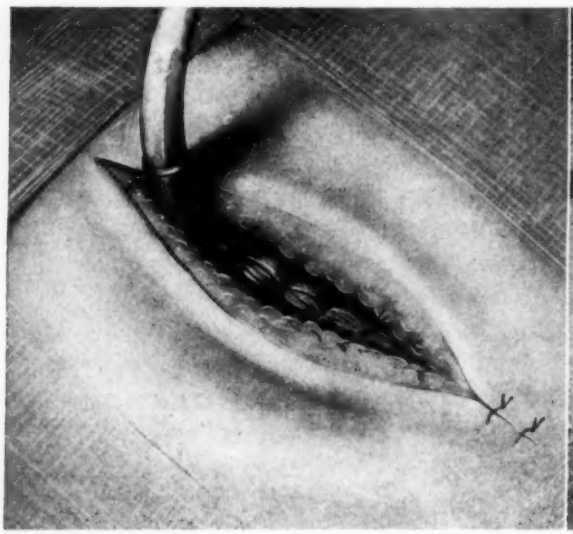

Fig. 11. Layer suture of parietal wound and tube in lower angle leading into bladder.

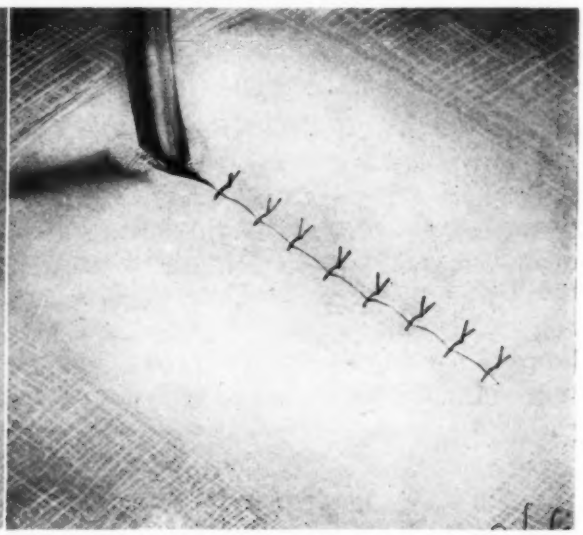

Fig. 12. Drainage of superficial wound with gauze or rubber dam to suture line in bladder.

traction made upwards. The prostate is then transfixed with heavy catgut sutures and with the endotherm knife an incision is made through the gland proximal to the sutures, removing part of the prostate and the bladder with the seminal vesicles attached all in one piece. It is essential that the incision should include part of the prostate, otherwise the neck of the bladder may be opened into and its contents spilled.

If there is any doubt as to whether the prostate has been infiltrated by the neoplasm, it is advisable to insert radon seeds into the gland. If radium is not available, the remainder of the gland may be removed through a secondary perineal incision.

The next step is the preparation of the ureters for cutaneous implantation. The ureters are freed retroperitoneally so as to straighten out all kinks and curves. It may be necessary to mobilize the ureter for a distance of 3 to 4 inches, if necessary as high as the renal pelvis so as to allow the ureter to lead perfectly straight from the kidney to the skin without the least trace of traction. A small gridiron incision is made internal to each anterior superior spine, and the end of the ureter with the temporary ligature still in place is brought through this small opening allowing 2–3 cm. of ureter to project beyond the margin of the skin. It is essential that the peritoneal reflexion at the site of the gridiron stab incision is pushed away, otherwise the ureter may be pulled through the peritoneal cavity in its exit to the skin. The temporary ligatures are now removed and the ureters are intubated up to the renal pelvis with ureter catheters or preferably rubber tubes. The ureters are then sutured to the skin with a few fine silk sutures. A silk ligature is tied around the distal end of the ureter and its tube and the small gridiron incisions are closed with a few sutures and drained with a few small wicks of gauze. A vaseline dressing is applied around the ureter stump. The patient is lowered to a horizontal position and the abdominal incision is closed in layer suture after providing adequate drainage down to the stump of the prostate with a large cigarette drain.

General Considerations:

Case Selection.

1. Extensive involvement of the trigone by an infiltrating tumor compromising both ureters so that they have to be sacrificed.

2. Infiltrating growths at the neck of the bladder involving the sphincter region.

3. Invasion of the prostate from an infiltrating growth at the neck of the bladder.

4. Extensive infiltrating carcinoma involving the greater part of the bladder.

5. Multiple carcinomata covering too large an extent for radon implantation.

Preoperative Care. Renal function should be thoroughly investigated, as not infrequently as a result of obstruction of the ureter and consequent infection, considerable kidney damage may have been sustained. Intravenous urography is of inestimable value in determining the extent of renal involvement. If the kidneys are hydronephrotic or badly infected, it may be advisable to do a preliminary nephrostomy or cutaneous ureterostomy before proceeding with cystectomy. As many of these patients are in a debilitated condition, a preoperative transfusion is often of great benefit.

Operative Aids. The Trendelenburg position facilitates greatly in exposure of the operative field. Spinal anesthesia or avertine supplemented by ethylene or gas oxygen are the anesthetics of choice. Intravenous glucose injections during the operation should be routinely used.

Postoperative Care. Transfusions and continuous intravenous infusions of glucose are our two mainstays in combatting shock and supplying fluids for the first few days. The indwelling ureter catheters or tubes require considerable care during the period of convalescence. It is essential that there is free drainage from both kidneys. Should a catheter become plugged, gentle aspiration or if this is not successful, injections of acriflavine 1:4000 will usually aid in starting the flow of urine. All these proceedings must be carried out under the strictest asepsis. The ends of the tubes should be immersed in an antiseptic solution before injections are made. At the same time, acidifiers and dietary measures have to be employed to render the urine acid, otherwise the tubes may become incrusted with phosphatic salts or phosphatic calculi may form in the renal pelvis. The distal end of the ureter beyond the ligature generally sloughs away at the end of a week leaving the proximal end attached to the skin. If the neostomies function well the ureter tubes should not be changed for ten days to two weeks. The drain to the prostate bed is gradually shortened as the discharge from the sinus tract which at first is profuse, diminishes. Occasionally, especially if there had been any tension on the ureter, the lower end may become detached and retract upwards. This will necessitate exposing the ureter higher up and doing another implantation, or if this is not feasible, a nephrostomy. When the patient is up and about, an *x*-ray is taken to be sure the catheters are properly adjusted. The two ureter tubes are joined together with a "Y" shaped connecting tube which drains the urine into a bag suspended from the waist. The kidneys are irrigated once or twice a week with acriflavine 1:4000 and the tubes changed once to twice a month or more often should they become incrusted.

End Results:

We have had 19 cases in which a total cystectomy with cutaneous ureterostomy was performed, with an operative mortality of 21 per cent. Of those cases surviving operation, 5 are alive for periods of from five to nine years. Of the remaining 9 cases, 7 were done recently and two are apparently well: one, two and half years, and one, one and a half years after operation.

RADICAL OPERATION FOR TERATOMA TESTIS

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THE radical operation for teratoma testis occupies an anomalous position in surgery. It is regarded by the majority as useless, and those few who see some virtue in it are uncertain when to use it. The advent of more powerful machines for radiation and the hormonal test have tended to confuse the indications.

The pathologic classification of tumors of the testis is still in confusion. Many of these tumors cannot be classified or they are classified differently by different pathologists. They do have this in common: almost all are malignant and, from the clinical point of view, all types behave in the same way, even the rare spindle cell sarcomas, and all metastasize first to the primary lymph zone of the testis. They show, however, these two important differences: First, some are radiosensitive, others, radioresistant; second, some cause the excretion of a gonadotropic hormone in the urine, others do not. At the present writing, pathologists are unable to predict either the radiosensitivity or the hormonal reaction by a microscopic study. Careful correlation of these two reactions with the microscopic pictures may lead to the attainment of this ability in the future.

At present one can recognize the homologous and the heterologous types of tumors. The former, rare and in dispute, are comprised mainly of the sarcomata and the so-called pure monocellular seminomata, and an experience of two years with the hormonal tests by Powell and the writer seems to show that none of these tumors causes the excretion of a gonadotropic hormone. The heterologous tumors are of two kinds: First, the mixed tumors of adult tissue, the so-called organized embryomata, dermoid cysts and adult teratomata; second, embryonal tumors arising from totipotent sex cells which may show predominance of trophoblastic (chorionepithelioma), hypoblastic (embryonal adenocarcinoma), mesoblastic (sarcomatous mixed tumors) and epiblastic (neuroepitheliomata) elements. These latter are the embryonal carcinomata and, as a group, are the only tumors which cause the excretion of a gonadotropic hormone. There are many variations in the output of hormone by these tumors. Recently one of our patients, who had received repeated radiations, had, just before death from extensive metastases with chorionepithelioma, more than one million mouse units of hormone in his urine, and another patient with a typical embryonal carcinoma and palpable metastases, who received intensive radiation also, has failed to show any hormone on five separate tests.

It is not always possible to say which tumor will respond favorably to *x*-ray therapy and which will not, and this places the indications for radical operation in a very uncertain position.

In a recent summary of the problem, I suggested that patients be divided into two groups:

GROUP I

PATIENTS WITHOUT CLINICAL EVIDENCE OF METASTASIS, IN GOOD PHYSICAL CONDITION

A. The subgroup in which the gonadotropic hormone disappears within two weeks after castration.
   1. Structure indicates radiosensitivity. Prognosis good.
   2. Structure indicates radioresistance. Prognosis fair.

B. The subgroup in which the gonadotropic hormone is still present in the urine two weeks after castration. The therapeutic test by irradiation.

1. Causes its diminution or disappearance, which indicates radiosensititivy. Prognosis fair.
2. Has little or no effect on the amount of hormone excreted, which indicates radioresistance. Prognosis poor.

GROUP II

PATIENTS WITH CLINICAL EVIDENCE OF METASTASES

A. Those in good physical condition.
   1. Radiosensitive (metastases and hormone diminish or disappear under radiation). Prognosis fair.
   2. Radioresistant. Prognosis poor.

B. Anemic or cachectic patients (usually hopeless irrespective of the type of tumor).

In a consideration of such a grouping, the patients in Group I with radioresistant tumors would be candidates for radical operation. Since the publication of this paper, the marked variations in the quantitative output of hormone after radiation which we have found in the different types of tumors makes the use of a therapeutic test very uncertain.

Radical operation like castration, if done at all, must be done early. Therefore, if radical operation is of use at all it should be used on all patients without clinical evidence of metastases in whom malignant tumor is proved after castration. When metastases are palpable, the operation is impractical, since a clean, complete removal of the lymph zone in all probability will be impossible.

The operation is done in two stages, of which castration is the first. The cord should have been dissected free and divided high in the inguinal canal with an actual cautery before manipulation of the tumor in the scrotum. (Fig. 3B.) This is of importance in order to prevent general metastases from the squeezing of tumor cells into the blood stream. If the operation is to be done immediately following castration, confirmation of the diagnosis must be absolute before proceeding. Consultation with an expert pathologist who studies frozen sections before giving his report is in order. A gross diagnosis is too uncertain to be relied on.

LINE OF INCISION

The incision is so extensive that certain nerve trunks supplying the abdominal muscles and skin over the hip, upper portion of the thigh and pubic regions are almost always divided. Nevertheless

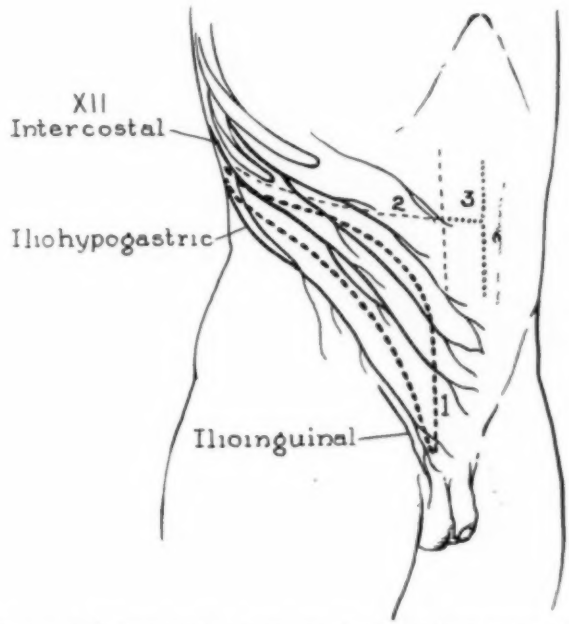

FIG. 1. Diagrammatic representation of various types of incisions for retroperitoneal exposure of pre-aortic lymph zone which have been used by writer. He prefers that numbered 1.

by curving the incision so as to follow the course of the iliohypogastric and ilioinguinal nerves the larger and more important branches remain uninjured. In none of my patients have after-effects been troublesome. There have been no postoperative hernias or complaints of weakness of the abdominal walls. Several types of incision have been used. In my first cases the incision was extended from the high inguinal incision, previously made over the external ring, to a point about 2 cm. inside of the anterior superior spine, following the general direction of Poupart's ligament, and then was carried in a curved direction to about 1 cm. below the tip of the twelfth rib which it paralleled for about half its length (Fig. 1). With this incision the position of the patient is of considerable importance in enabling one to get a satisfactory exposure of the pre-aortic area. A medium-sized pad was placed under the opposite costal margin.

The opposite leg was slightly flexed and the corresponding leg kept straight so as to fit the hips in an oblique position.

Fig. 2. Exposure of lymph area over iliac vessels up to bifurcation of aorta.

The patient should not be completely on his side but halfway between the lateral and dorsal position. The usual position for a kidney operation is too extreme for satisfactory exposure. The arms should be folded in front of the patient and the sleeves pinned together to hold them in this position and the shoulders should be more nearly vertical than the hips. The position is a bent dorsolateral one. In later cases, however, patients were placed flat on their backs, and the incision was carried up along the edge of the rectus for some distance before curving it out beneath the twelfth rib. (Fig. 1.) The fascia of the external oblique, internal oblique, transversalis, and latissimus dorsi muscles was divided with a scalpel in the line of the incision.

STRIPPING OF THE PERITONEUM

The only difficulty in stripping up the peritoneum is encountered in the lower portion over the iliac vessels, and in the neighborhood of the bladder. As a rule the spermatic vessels, as well as the

Fig. 3. Exposure of lymphatic chain on right side in which spermatic vessels and ureter have stripped up with peritoneum. Insert shows method of exposing cord, isolating and dividing it with a cautery before manipulating tumor in scrotum.

ureter, tend to strip up with the peritoneum in this portion. When this occurs it increases considerably the difficulty of a clean dissection. This stripping usually can be prevented by putting gentle traction upon the cord at the time the peritoneum is stripped from along Poupart's ligament so as to keep the cord and its vessels recognizable. The peritoneum can then be stripped back by gentle gauze dissection without carrying the spermatic vessels with it. At the point where the vas deferens passes down behind the bladder the peritoneal boundaries may be outlined with difficulty. After the vas deferens has been divided at the point where it disappears behind the bladder, with gentle traction on the clamp holding the cord, the peritoneum usually can be stripped back easily so as to expose the iliac vessels and the aortic bifurcation. (Fig. 2.) The further retroperitoneal exposure of the abdominal

aorta is usually not difficult. The gloved hand can be pushed between the parietes and the peritoneal surface, exposing, in succession, the psoas muscles with the ureter overlying them, the lower pole of the kidney, and, finally, the aorta and the vena cava (Fig. 3). The peritoneal dissection should be carried to the renal pedicle. In three cases the largest lymph gland was found at this level and in two there were glands above the renal pedicle. In two postmortem examinations, invaded lymph nodes were found above the renal vessels. The dissection of lymphatic areas is much facilitated by a complete and thorough retroperitoneal exposure. The peritoneum with the abdominal contents behind can be held back with moist gauze sponges beneath broad retractors. In none of the cases was the peritoneum opened, except in the fourth patient operated on, when, in attempting to dissect out the vas deferens in the inguinal region, a small tear was made; this probably resulted from the fact that stripping of the peritoneum had been attempted high up before this lower exposure had been completed.

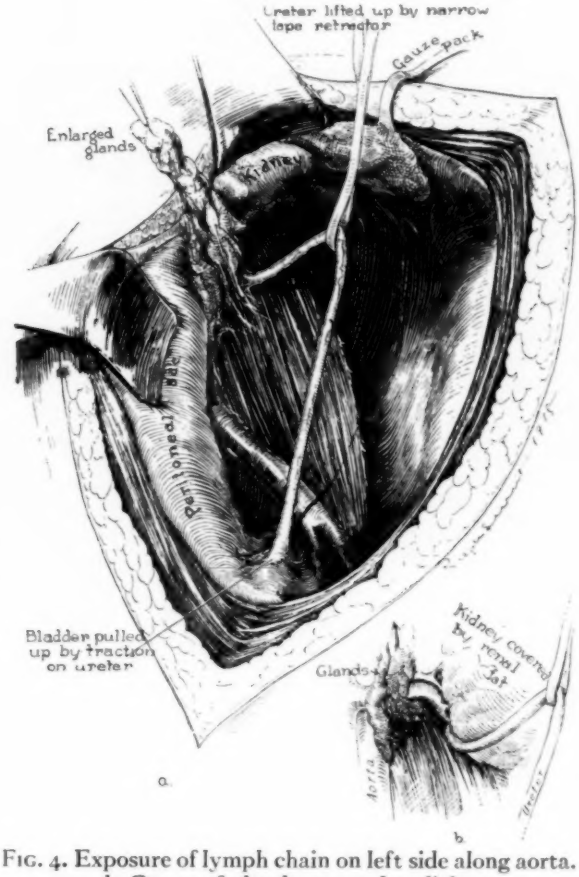

Fig. 4. Exposure of lymph chain on left side along aorta. *b*, Group of glands at renal pedicle.

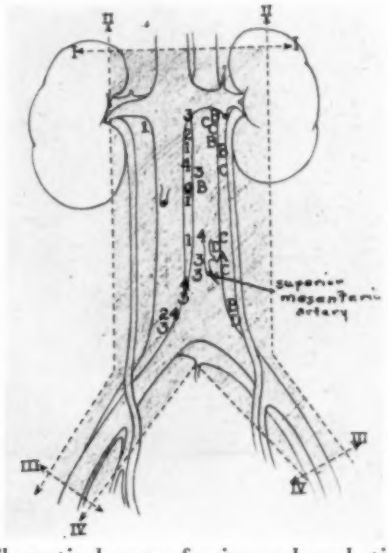

Fig. 5. Theoretical zone of primary lymphatic metastases in tumors of testis. I, II, III and IV are boundary lines, well outside general area of distribution. 1, 2, 3, and 4 indicate relative position of glands on right and A, B, C and D, on left, demonstrated by injection in four different cadavers respectively.

RESECTION OF LYMPHATIC AREAS

This is likewise more thoroughly done in two stages; first, dissection of lymphatic tissues from off the iliac vessels and aortic bifurcation, and, second, dissection of pre-aortic lymph areas and spermatic vessels. In every case, as shown in the illustrations, there were masses of lymph tissue lying on the external and common iliacs as far up as the aortic bifurcation. This area had to be cleaned separately from the spermatic vessels. It was easily effected in the 14 cases by careful blunt dissection with the dissecting scissors, beginning low on the external iliac and working along this vessel to the bifurcation of the aorta. At this point lymph tissues may extend deep down on to the sacrum and care in removing them is necessary in order to avoid injury to the middle sacral artery.

The pre-aortic area may be resected in one of two ways: from above downward, or below upward. The former is preferable.

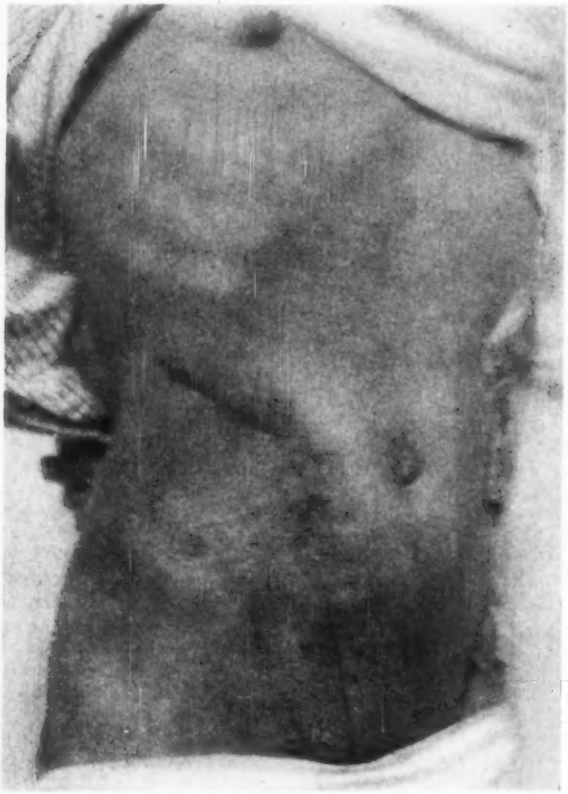

Fig. 6. Photograph of patient, after discharge from hospital, showing scar of incision 1.

With good retraction and complete peritoneal stripping of the area an excellent exposure is possible. The ureter should be carefully dissected free of the fascial coverings and held aside by a narrow tape as shown in Figure 4. In most of the cases it was found advantageous to conduct the dissection from below, upward to within a short distance of the renal pedicle, and then complete the removal of the lymph area by freeing it at its upper portion, and dissecting down to meet the former dissection. In two of the cases, the glands and lymph tissues were adherent to the vena cava in this area. Frequently there was considerable venous oozing directly from the vena cava when small veins were torn or cut at its surface, but in no instance was there difficulty in thoroughly ligating these points. In some instances a portion of the wall of the vena cava was seized in the clamp and caught afterward in the ligature. This

Fig. 7. Photograph of lymphatic and spermatic vessels and lymph glands removed from last patient operated on. None of these glands showed any evidence of metastases.

difficulty was particularly noticeable in the fourth patient operated on in whom the adhesions were most marked. In this patient metastasis to the lymph nodes was extensive, and apparently there were numerous small venules directly from the vena cava supplying them. In all instances, by careful dissection, it was possible to remove the spermatic and lymph areas *in toto*. The spermatic artery can easily be clamped as it issues from the aorta, and the spermatic vein as it enters the

vena cava or renal vein, the points being easily found when gentle traction is placed on the vessels.

Experience has shown that metastases occur to the secondary lymph nodes almost as early as to the primary. Metastases occur in much the same manner in all varieties of tumor. Each testicle has its own primary group of glands which intercommunicate and also receive lymph from other structures. The number and arrangement of each group vary so much that the general distribution rather than any particular arrangement is of clinical importance. The primary lymph nodes anastomose freely through efferent vessels with an immediate secondary group. Invasion of the primary glands on the opposite side and the immediate secondary glands of both sides may occur early. Tumor cells may be carried in the blood stream to the viscera, usually the lungs and the liver, and when this has occurred, operation is useless. The operation, therefore, should attempt the removal of all the lymphatics of the general distribution of the right and left primary and immediate secondary groups. This generalized area has been clearly determined (Most, 1899, Cuneo, 1901, Jamieson and Dobson, 1910). It may be bounded (Fig. 5) by an imaginary transverse line from 1 to 2 cm. above the renal pedicle, by vertical lines extending from this point on each side—just outside the vena cava on the right, and from 1 to 2 cm. outside the aorta on the left to the level of their bifurcation, and then follow along the iliac vessels to cross at the upper third of each external iliac and follow these vessels back to about 1 cm. below the bifurcation.

TABLE 1

	Group I Patients without Metastases		*Group II Patients with Metastases*
Treatment	Radical Operation	Castration and Radiation	
Number of patients	14	11	29
Dead	3	3	20
After 4 years	None	1	2
Living	11	8	9
Prognosis 1 (good)	10	1	None
Prognosis 2 (fair)	None	4	4
Prognosis 3 (poor)	1	3	5
Over 4 years	4 (1)	1 (2)	1 (2)

The dissection on the right side is much easier than that on the left on account of the superior mesenteric artery, so much so that it is a question whether one should not make the exposure on the right for removal of the pre-aortic and renal lymph nodes even if the tumor is on the left side. In this case, a low abdominal incision on the left would be required to remove the lower lymphatics at the aortic bifurcation and along the iliac vessels. (Fig. 2.) Figure 6 is a photograph of patient number 12 after discharge and Figure 7 shows the chain of lymph glands removed in the last patient (number 14).

SUMMARY OF CASES

The following gives a brief analysis of 25 patients who had no clinical evidence

of metastases when first seen, and of 29 patients who had clinical evidence of metastases. The term *teratoma* designates a mixed type of malignant tumor, and *seminoma*, the homogeneous type composed of large polygonal cells which resemble spermatocytes.

Of the 25 patients in Group 1, with no evidence of metastases, 14 have had radical operation (Table 1), 9 for tumor on the right side and 5 for tumor on the left. Ten are living, all with a good prognosis (no metastases, no hormone); 4 are dead.

Of the 14 patients who had radical operation, 7 showed metastases in the glands removed at operation. Four of these are living; fourteen years, four years and ten months, one year and one month, and three months respectively. Three are dead.

Seven had glands removed which did not show metastases. In 2 of these patients there was an unusual degree of endothelial hyperplasia of the lymph nodes; 1 of these patients is living and well six years and one month after operation, 1 is dead. The 5 others are now living; one for eight years and nine months, one, two years and eight months, one, one year and four months, and two for one year after operation.

Of the 11 patients without metastases, treated by castration and *x*-ray therapy, 8 are living: 1 for two years, with a good prognosis; 4 with only a fair prognosis because the hormonal tests are positive; and 3 with a definitely poor prognosis (metastases have appeared and the amount of hormone in the urine has increased in spite of irradiation). Of the 4 patients with a fair prognosis, 1 lived seven years before metastases appeared, but now the amount of the hormone in the urine is increasing in spite of *x*-ray therapy; another has lived seven years since castration but, although metastases are not evident clinically, the amount of the hormone in the urine is increasing. The other 2 with a fair prognosis have lived one and three years respectively without clinical metastases but with positive hormonal tests.

Of the 29 patients with clinical evidence of metastases when first seen, only 9 are alive; 4 have a fair prognosis (the tumor is radiosensitive in each instance and the patients have lived five years, one and one-half years, six months and a few months respectively; all have positive hormonal tests); 5 of these 9 patients have a poor prognosis (the tumor is radioresistant). The case of one of the 20 patients who died is rather remarkable and illustrates the marked radiosensitivity of some tumors. In 1926, this man developed bilateral teratomata and was given an intensive course of *x*-ray therapy. The first evidence of abdominal metastases appeared in 1930 and disappeared promptly under a second course of treatment. He died in 1933 of gastric ulcer, almost eight years after castration, apparently without recurrence. Unfortunately there was no autopsy.

The comparative results in the foregoing groups of patients may be summarized as shown in Table 1.

NEPHRECTOMY AND NEPHRO-URETERECTOMY FOR MALIGNANT TUMORS OF THE KIDNEY

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MALIGNANT tumors of the kidney are of two types: (1) those which primarily involve the cortical or secreting substance of the kidney, including adenocarcinomas (Fig. 1), sarcomas, and Wilms' tumors (Fig. 2), and (2) those which have their origin in the renal pelvis, such as papillary squamous cell epitheliomas (Fig. 3). Because papillary squamous cell epithelioma metastasizes along the ureter, it is essential, when such a lesion is present, to remove not only the kidney but the ureter as well. In order to complete the ureterectomy, it will be necessary to remove that portion of the wall of the bladder through which the intravesical portion of the ureter passes. The clinical value of complete removal of malignant lesions of the kidney is evidenced by the results, a sample of which will be given later in this paper.

TECHNIQUE OF NEPHRECTOMY AND NEPHRO-URETERECTOMY

In 1912, W. J. Mayo[4] suggested a posterolumbar incision, taking the outline of a miniature hockey stick, for use in exposure of the kidney. The upper angle of the incision begins slightly above the costovertebral angle and extends downward in an almost vertical direction to a point midway between the infracostal arch and the crest of the ilium (Fig. 4*a*). At this point the incision swings anteriorly, parallel with the crest of the ilium. The skin, subcutaneous fat and quadratus lumborum muscles are cut, and the posterolumbar layer of fascia is cut through in a similar fashion; this exposes the retroperitoneal fat. Care should be taken not to injure the ilio-inguinal and hypogastric nerves, which are joined in a common trunk and lie along the outer edge of the iliopsoas muscle (Fig. 4*b*). The retroperitoneal fat is more yellow than the fatty capsule of the kidney. Care must be taken not to open the peritoneal cavity. Should such inadvertently occur, the peritoneum should be immediately closed by suture. By retracting the retroperitoneal fat forward, the fascia of Gerota is exposed. This is incised. By blunt dissection the perirenal fatty capsule of the kidney is reflected, and the purplish red color of the kidney is noted.

If the kidney and its tumor are difficult of accessibility, much better exposure of the kidney and its pedicle can be obtained by performing subperiosteal resection of the twelfth rib. This is a routine in many of the European clinics in all cases in which nephrectomy is being carried out for renal neoplasm. The incision is made through the muscle to the periosteum of the rib. This is incised, the periosteum reflected with a periosteal elevator, and the rib removed after cutting it as close as possible to the vertebra. Care must be taken not to tear an opening in the pleura; such an accident manifests itself by a sound of suction. Such openings should be closed immediately else subcutaneous emphysema of the adjacent tissues may occur. Atelectasis of the lungs on this side must be watched for when the pleura has been opened.

The kidney is delivered from the incision, and the ureter identified and divided between forceps; both ends of the ureter are ligated. The fat is removed from both the anterior and posterior portions of the renal pedicle by gentle, backward dis-

section, using a bit of gauze on the end of a dissecting forcep. When the renal pedicle has been cleared of fat, two or three curved

Fig. 1. Adenocarcinoma of kidney (hypernephroma).

forceps are applied across it (Fig. 5) and the kidney is removed by cutting across the pedicle between the hemostats. The blood vessels of the pedicle of the kidney are triply tied *en masse*. If the lesion proves to be a papillary squamous cell epithelioma of the renal pelvis, the ureter is freed of its surrounding peritoneum and fat by blunt dissection, down as far as the surgeon conveniently can reach, working through the posterolumbar incision. The posterolumbar incision is closed, the patient is placed in the Trendelenburg position, and, through an incision low in the median line, or through a right inguinal incision, the skin, subcutaneous tissue, fascia of the external oblique muscle, the internal oblique muscle, and the transversalis fascia are incised. By retracting the peritoneum inward the ureter is identified at the point where it crosses the external iliac artery, and dissection is carried down to the bladder. A portion of the vesical wall, shaped like a truncated cone, approximately 2.5 cm. in diameter at its base, is removed; this contains the intravesical portion of the ureter. The opening thus made in the bladder is closed by two rows of sutures of chromic catgut. One or two thin rubber (Penrose) drains are inserted down to this region, and are allowed to remain there for seven days. At the conclusion of the operation, after closure of the incision, a retention catheter is placed in the bladder, through the urethra, to be left in for a period of a week or ten days, thus preventing tension on the closed opening in the bladder. It is advisable, in performing nephrectomy for malignant tumor of the kidney, to remove as much of the fatty capsule of the kidney as is possible, and it is not necessary to drain the renal fossa unless complete hemostasis cannot be secured. In case hemostasis cannot be secured, strips of iodoform gauze and drains of gutta percha or thin rubber (Penrose), or a split tube, are placed in the renal fossa, and the ends are allowed to extend outward. The incision is closed around the drain. These drains are left in place for approximately seven days. When gauze has been inserted, a few days before its contemplated removal a weak antiseptic solution is poured into the sinus tract daily to loosen the gauze.

Control of Bleeding from the Renal Pedicle by Forceps. When a malignant renal tumor is extensive, or the patient is obese, the renal pedicle may be so short that it is difficult of accessibility; especially may this be true when extensive renal tumors involve the renal vein. Under these circumstances there may be such thickening of the tissues in the renal pedicle that the surgeon hesitates to rely on ligatures to control the bleeding, for fear that they might slip off. Under these circumstances, rather than tying the pedicle, hemostasis can be secured by leaving the curved hemostats on the renal pedicle for seventy-two hours, closing the incision around them, and preventing them from pressing on the retroperitoneal structures by placing iodoform gauze beneath the forceps. The proper way to remove such forceps is to unlock them but not to open them completely. After unlocking them, they should be allowed to remain in place for six or eight hours. During this time serum will release the forceps from the blood vessels of the pedicle and they can be

removed at the later time without fear of opening the mouths of the blood vessels.

FIG. 2. Embryomatous type of mixed tumor of kidney (Wilms' tumor). This patient was living and well thirteen years after removal of tumor.

Transperitoneal Nephrectomy through an Anterior Incision. The anterior approach is occasionally preferable if renal tumors are very large. Thus they are more accessible, and dissection of important structures from the tumor and its pedicle can be performed under visual control. The anterior approach also permits exploration of the liver for metastasis. If the incision is on the right side, dissection of the retroperitoneal portion of the duodenum and of the inferior vena cava, from the tumor, can be performed under visual control. When the incision is on the left side, accurate dissection of the descending colon and its mesocolon, from the tumor and from the renal pedicle, is possible. The risk of transperitoneal nephrectomy is higher than is the risk of extraperitoneal removal through a lumbar incision. One reason for this is that the transperitoneal method is chosen only when the tumor is of large size, and in such cases the risk of removal is recognized as being greater than when the tumor is small.

COMPLICATIONS AT OPERATION

Hemorrhage. When the renal neoplasm is an adenocarcinoma, the fatty capsule of the kidney contains a network of large veins. If, therefore, incision is made through this fatty capsule for any great extent, it becomes almost obligatory that the kidney be removed. Otherwise the bleeding from these severed veins in the renal capsule will continue to an alarming degree, and such bleeding is exceedingly difficult to control. This bleeding stops spontaneously with removal of the kidney and its tumor. It should be determined with as much certainty as possible therefore, when renal tumors are large, whether or not the lesion can be removed before the renal capsule has been subjected to too much manipulation.

If a considerable amount of blood has been lost during the operation, which not infrequently occurs as a result of bleeding from the veins in the fatty capsule of the kidney, immediate transfusion of blood is advisable. The simplest method is to use the indirect transfusion of citrated blood. If a donor is not immediately available, 500 c.c. of a 6 per cent solution of acacia

intravenously injected has been found to be of the greatest value in maintaining a reasonably normal blood pressure and in

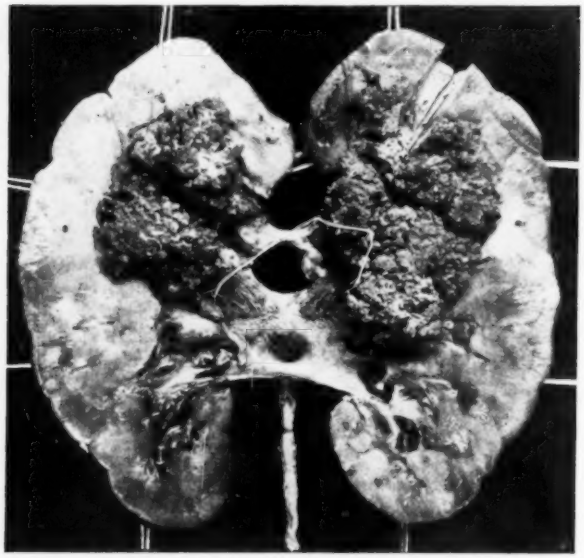

Fig. 3. Squamous cell epithelioma of renal pelvis.

preventing shock. It is absolutely essential that the solution of acacia be freshly prepared and that the acacia be accurately tested experimentally to eliminate the possibility of the presence of impurities. If solution of acacia is not available, 1000 c.c. of physiologic solution of sodium chloride, injected intravenously, will temporarily tide a patient over a period of reaction from immediate loss of blood. Transfusion of blood offers advantages that are far superior to other methods, and should be employed if possible.

Injury to the Retroperitoneal Portion of the Duodenum and to the Inferior Vena Cava. When the lesion involves the right kidney, the two structures which are most likely to be injured are the retroperitoneal portion of the duodenum, and the inferior vena cava. Injury to the former may result in a duodenal fistula, which may be fatal. In many cases the retroperitoneal portion of the duodenum lies directly in contact with the renal pedicle, and, unless carefully retracted, is likely to be injured or opened when forceps are applied to the pedicle. Should such an accident occur, the opening in the duodenum should be closed immediately with separate rows of sutures, and the area of the closure should be protected by suturing over it peritoneum, fat, or omentum if it is accessible, to serve as a patch to assist in healing. Occasionally the renal tumor will extend through the lumen of the renal vein into the inferior vena cava, like a polyp. In such cases this polypoid projection frequently can be squeezed back into the renal vein before forceps are applied to the pedicle. On a few occasions[10] we have successfully opened the vena cava, have pushed back the prolapsing and projecting portion of renal neoplasm, and have sutured the opening made in the vein. On other occasions small openings have been inadvertently made in the inferior vena cava in the course of removal of large renal neoplasms. These openings have also been successfully sutured, or closure has been obtained by temporary application of hemostats to the cut portion.[10]

POSTOPERATIVE PRECAUTIONS

Of prime importance in postoperative care is the maintenance of an adequate intake of fluid, control of gastrointestinal stasis, and determination of renal function.

Adequate Intake of Fluid. Experience has shown that an intake of fluid of from 2 to 3 liters each twenty-four hours subsequent to operations on the kidney will increase the smoothness of convalescence. During the first few days, when there is a tendency to partial ileus as a result of the anesthetic and the operation, and especially when retroperitoneal manipulation in the region of the splanchnic nerves has been rather severe, it is difficult for water to leave the stomach, so that fluids can best be administered by proctoclysis, subcutaneous infusion, and intravenously.

The advantage of intravenous administration of physiologic saline solutions becomes more obvious as that method is increasingly used. If its use is continued for any considerable time, there may be a tendency for retention of chloride; this is evidenced by edema of dependent tissues. Should this occur, sodium chloride can be

omitted from the solution and a 10 per cent solution of glucose substituted.

Control of Abdominal Distention. It should also be remembered that subsequent to nephrectomy, particularly when the tumor is large, temporary ileus may cause very troublesome abdominal distention. Moderate dilatation of the stomach may be associated with this, in which case a stomach tube should be inserted to remove accumulated gastric secretion and gas. Should there be a considerable quantity of both, the stomach must be kept empty by passage of the stomach tube every six or eight hours. An even more effective procedure is to pass a small tube through the nares into the stomach, to leave it in place, and to remove fluids and gas by the nasal suction method of Wangensteen. In general, the temporary ileus will last for at least three days, during which time enemas usually are not effective. Therefore, the use of hot stupes on the abdomen and administration of a reasonable amount of morphine will give the patient considerable comfort for, as has been shown experimentally by Orr, in such cases morphine, administered in not too large quantities, contrary to general opinion does not obtund intestinal peristalsis but on the contrary stimulates it. From the third day onward, stimulation of peristalsis can be achieved by administration of cathartics, such as castor oil and magnesium sulphate, and by the use of enemas. Occasionally, when gas tends to accumulate persistently in the large bowel, use of copious rectal irrigation, with the patient in the knee-chest position, will serve to straighten the kinks in the bowel and materially promote expulsion of gas.

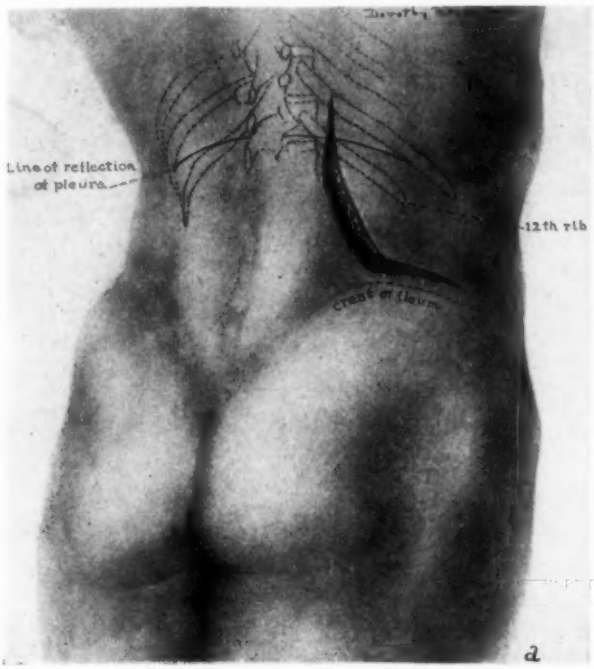

Fig. 4*a*.

Fig. 4*b*.

Fig. 4*a*. Posterolumbar type of incision (Mayo); *b*, relations of ilioinguinal and hypogastric nerves.

Determination of Renal Function. The value of this method of keeping informed as to the efficiency of elimination is obvious.

Results of Nephrectomy for Malignant Renal Neoplasm

A postoperative study was made in 1933, of all patients from whom malignant renal tumors had been removed in the years 1901 to 1927 at The Mayo Clinic, in order to determine the results of surgical treatment of such lesions. Renal tumors were removed from 256 patients and 110

patients (42 per cent) lived five years or more after operation.[9] Quoting from the paper in which this study was reported:

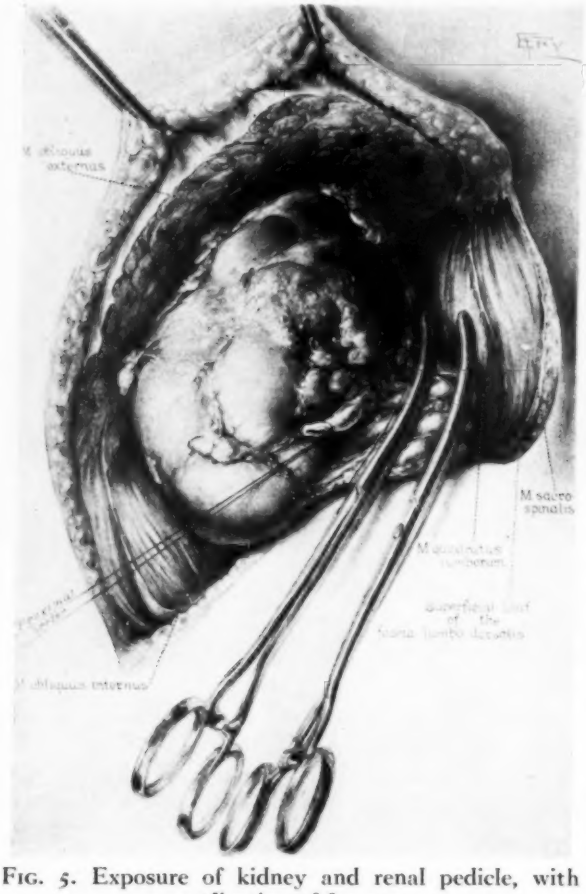

Fig. 5. Exposure of kidney and renal pedicle, with application of forceps.

"Of further interest is the fact that 68 of the 110 patients have lived from five to ten years; 22 have lived ten years or more; 15 have lived from fifteen to twenty years, and 5 have lived more than twenty years." Although the purpose of

. . . that study was primarily to report the number of patients surviving longer than five years after the removal of malignant tumors, the fact must not be lost sight of that among those patients who lived less than 5 years, the surgical treatment directed toward the eradication of the disease undoubtedly prolonged the patients' lives and made them more comfortable.

In 41 additional cases, the malignant tumor of the kidney was so extensive, as determined by incision and exploration of the tumor, that the lesion could not be removed and after specimens were taken from the tumor for microscopic examination, roentgen rays and radium treatment were instituted. Seven (17

Fig. 6. Excretory urogram, showing renal deformity caused by neoplasm in right kidney.

per cent) of these 41 patients who had seemingly inoperable malignant renal tumors lived for more than five years.

Living Patients. Of the 110 patients who lived five years or longer following removal of malignant renal tumors, it was found that 76 were living and well in 1933, whereas 34 had died. Analysis of the 34 cases in which the patients have died would indicate that known recurrences had taken place in 16 with metastasis to various tissues as follows: bones, lungs, and brain.

Degree of Malignancy of Renal Tumors. For the past ten years, the grading of malignant tumors has been a routine at the clinic, and Broders'[2,8] index of malignancy has been used. In a study[9] of the degree of malignancy of the 110 malignant renal tumors removed from patients who lived five years or longer, it was found that grade 2 or 3 occurred most frequently. In 43 cases the grade was 2, and in 21 cases it was 3. In only 4 cases were there five year cures of patients whose tumors were graded 4. Seventy per cent of the patients who had tumors of malignancy graded 1, and whose tumors were removed, were living in 1933, 67 per cent

of those who had tumors graded 2, 62 per cent of those who had tumors graded 3, and none of those with tumors graded 4.

Radiologic Treatment. In the last few years considerable attention has been paid to advantages which might be gained by preoperative and postoperative irradiation. It has been claimed that reduction in size of the tumor by means of deep roentgen-ray treatment before operation would be a distinct advantage to the surgeon. A decrease of from 50 to 75 per cent in the size of the renal tumor is not uncommon subsequent to a course of radiation. However, the results of radiation depend largely on the embryonic elements present in the kidney. Since the majority of renal tumors of adults are not necessarily of embryonic type, marked decrease in size will not occur in all cases. It also has been claimed that obliteration of some of the blood vessels may occur, with considerable reduction in the amount of bleeding at the time of the nephrectomy. However, this advantage is offset in some cases by fixation of the kidney, which may result from cicatricial changes following radiation. It is not generally realized that at least two months should elapse after completing a course of deep roentgen therapy before considering operation.

Apparently some credit should be given to the postoperative use of roentgen rays and radium as adjuncts to surgical treatment of malignant lesions. It has been our custom for many years to recommend courses of roentgen rays, with or without radium, immediately following recovery of patients from removal of malignant renal tumors and, in the group of 110 cases in which operation was performed for renal neoplasm, and in which patients were alive five years after operation, roentgen rays or radium were applied postoperatively in thirty-three. On the other hand, many patients have had thorough postoperative treatment without the course of the disease being affected in the slightest, and in fact radiation sometimes has seemed to hasten the end.

DIFFERENTIAL DIAGNOSIS

In the first place it is, of course, necessary to distinguish between extrarenal and intrarenal tumor. This in itself may be difficult to do when the tumor has its origin in, or is adjacent to, the capsule. As a rule, however, localization is possible by means of urography. After the neoplasm has been determined to be in the kidney it may not be so easy, however, to determine the exact nature of the tumor. It is of considerable importance in differential diagnosis to recognize simple renal cyst or polycystic kidney. Unfortunately, it is not always possible to identify a simple cyst by means of clinical examination and urography. Renal neoplasm often has a most insidious course and the clinical data may exactly parallel those found with simple cyst. Unfortunately, urography also may fail to identify the lesion. Although there are certain characteristics in the urogram which are quite typical of simple cyst, nevertheless a similar outline occasionally is observed when neoplasm is present. This means that in every case of intrarenal tumor, except when there is definite clinical evidence of polycystic kidney, the patient should be subjected to surgical exploration in order to exclude the possibility of neoplasm. As far as polycystic kidney is concerned, since the disease involves both kidneys, the lesion usually can be identified by the existence of typical bilateral deformity of the renal pelves in the urogram. Other clinical data are often present, such as bilateral renal enlargement on abdominal palpation, hypertension, and clinical evidence of renal insufficiency, which, combined with urography, usually permit a definite diagnosis. Needless to say, polycystic kidney is not a surgical condition unless complications make it so.

The question has been raised as to how much value can be placed on the excretory urogram as a means of identification of renal tumor. If the excretory urogram gives evidence of a deformity of the pelvis or of

the calices, which is typical of that observed with neoplasm, the findings can be relied on (Fig. 6). If, on the other hand, the outline of the calices and pelvis is distinct and normal, neoplasm usually can be excluded. Unfortunately, however, in the course of routine excretory urography, complete visualization of the calices and pelvis is not always achieved. Frequently the details of the calices are not shown, and minor deformity easily can be overlooked. In order to be certain of the condition, it is often necessary to make a retrograde pyelogram and to perform differential tests of renal function. Reliance on incomplete visualization in the excretory urogram may lead to serious error. In the last 42 cases of renal tumor the diagnosis was made from the excretory urogram only in 15.

CLINICAL CONTRAINDICATIONS TO OPERATION

Of 42 cases in which a tentative diagnosis of renal neoplasm was made in The Mayo Clinic in the past two years, in 9, or approximately 25 per cent, the condition was regarded as inoperable. Among the clinical data which might influence the physician in advising for or against operation are fixation and size of tumor, evidence of metastasis, and the general condition and age of the patient.

Physical characteristics of the tumor on abdominal palpation may be a factor in advising operation. A very large tumor, which apparently is fixed in position, offers a questionable prognosis even if successfully removed. The tumor should not necessarily be regarded as inoperable because of size only, however, since results following removal of a large tumor occasionally have been exceptionally favorable. It may be difficult to determine the exact degree of fixation on clinical examination, since a kidney which apparently is fixed may be found, on exploration, to be removable. Much will depend on the age of the patient and on his general condition in making the decision. If his general condition is favorable, exploration would be justified, leaving to the surgeon's judgment the decision as to whether or not nephrectomy should be carried out.

Among the clinical complications which must be considered in deciding for or against operation may be mentioned anemia, hypertension, and secondary infection with perinephritic abscess. In cases of neoplasm, anemia rarely results from loss of blood, but is the direct result of toxemia secondary to the tumor. When marked anemia is present, it usually indicates metastasis and offers a doubtful prognosis; it should be regarded as a distinct contraindication to operation.

It long has been known that hypertension frequently accompanies renal neoplasm. Sahli suggested that a hypernephroma may secrete a substance which might raise blood pressure. Ferguson and other observers have suggested that cortin may be present in hypernephromas because of the possible suprarenal anlage of such a tumor. However, little or no cortin was found in the tissue of several renal tumors analyzed by Kendall, of The Mayo Clinic. Hypertension, which may be coincident, should offer no contraindication to operation unless there is evidence of some consequent complication.

Hyperpyrexia occasionally is observed with hypernephroma, without any evidence of renal infection or other complication to account for it. Diffuse secondary infection occasionally will involve the renal parenchyma, apparently as a result of inadequate drainage. This may completely disguise the clinical picture so as to suggest pyonephrosis. A secondary perinephritic abscess occasionally may complicate the situation. It is essential, of course, that the kidney be removed as soon as this condition has been determined, in spite of the increased risk of operation.

Metastasis. It has been our clinical experience that the most common site of metastasis of renal neoplasm is the lungs. In every case of renal neoplasm, therefore, a roentgenogram of the thorax is necessary. As a rule, pulmonary metastasis is readily

recognizable, although occasionally there may be some question concerning interpretation of the shadows. Although, in the recent literature, several cases have been reported in which such metastasis has responded to roentgen therapy, such a contention is open to doubt. In a review of our cases in which pulmonary metastasis took place it was found that all patients except one were dead after one or two years, and there was some doubt as to the diagnosis in this case. Nephrectomy in the presence of diffuse pulmonary metastasis would, therefore, be a questionable procedure.

SUMMARY

In general, the most practical and frequently used incision for nephrectomy and nephro-ureterectomy begins at the costovertebral angle which overlies the affected kidney, curving down toward the crest of the ilium and then paralleling the crest of the ilium, the whole incision taking the shape of a miniature hockey stick. The patient lies on the side opposite to that of the incision. Extraperitoneal removal is performed. When tumors involve the right kidney, the proximity of the retroperitoneal portion of the duodenum and the inferior vena cava should always be borne in mind, for injuries of these structures may occur, and usually are followed by serious consequences. Subsequent to operation it is of great importance that adequate intake of fluid should be maintained. Preoperative and postoperative radiation may be of considerable value as an adjunct to surgical treatment. Particularly is this true if tumors are of embryonic type, or if certain unusually large adenocarcinomas are present.

Among the clinical data which influence the advisability of operation are fixation and size of the tumor, evidence of metastasis, and condition of the patient. Evidence of pulmonary metastasis should preclude operation. In the majority of cases a diagnosis can be made from the excretory urogram, providing visualization of the pelves and calices is complete.

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RADICAL CURE OF CARCINOMA OF THE PROSTATE*

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THE general purpose of the radical operation for carcinoma of the prostate is to carry out a sufficiently extensive procedure to cure cases of carcinoma. This presupposes that the cancer has not invaded the tissues beyond the reach of radical surgery. The operation, which I shall describe, is one I have now carried out in 50 cases.

The following are the important steps in carrying out this operation:

1. Patient in a proper perineal position.
2. Insertion of a sound in the urethra.
3. A curved perineal incision.
4. Opening of space on each side of central tendon, triangular ligament and in front of levator ani muscles with finger and handle of scalpel.
5. Division of central tendon.
6. Isolation and division of rectourethralis muscle; exposure of membranous urethra behind external sphincter.
7. Median line incision into and insertion of prostatic tractor, which is then opened out, making traction upon prostate.
8. Exposure of posterior surface of prostate, and careful examination of prostate to confirm diagnosis of carcinoma, and locate area involved.
9. Exposure of posterior surface of seminal vesicles.
10. Division of membranous urethra below prostatic juncture.
11. Transverse incision into bladder at vesicoprostatic juncture.
12. Insertion of long anterior retractor into bladder, exposing trigone, ureteral ridges and orifices.
13. Continuation of division through bladder wall, across trigone just below ureteral orifices.
14. Exposure of anterior surface of vesicles and ampullae by pushing bladder upward.
15. Isolation, clamping, ligating and division of vasa deferentia above ampullae.
16. Exposure of vascular and fibrous pedicle of vesicle, clamping, division and ligation.
17. Same procedure on opposite side.
18. Removal of entire prostate with its capsule, entire urethra, with a portion of the membranous urethra, cuff of bladder, both seminal vesicles, and ampullae of the vasa in one piece.
19. Careful arrestation of hemorrhage.
20. Insertion of No. 20 rubber catheter through the urethra and out stump of membranous urethra.
21. Anastomosis of membranous urethra and bladder.
22. Closure of remaining vesical wound.
23. Light iodoform gauze drains to each corner of deep wound.
24. Approximation of levator ani muscles; closure of skin wound with interrupted sutures of waxed silk.
25. Gauze drains brought out through right angle of wound.
26. Catheter, draining bladder, fastened in urethra.
27. Postoperative care.

DISCUSSION OF STEPS

1. *Patient in a Proper Perineal Position.* Many of the difficulties experienced by surgeons in attempting to attack the prostate through the perineum are due to an improper position. It is not sufficient to simply flex the thighs with a strap around

* From the James Buchanan Brady Urological Institute, Johns Hopkins Hospital.

the neck, and placing a pillow beneath the buttocks. The pelvis should be bent sharply at the junction of the dorsal and sacral

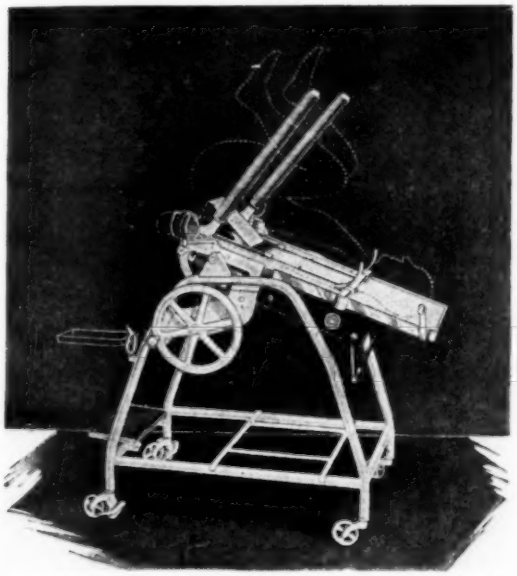

Fig. 1. Young's urological table. Patient in perineal prostatectomy position. Note automatic pelvic elevator.

spines, and the perineum carried upward, so as to be almost parallel to the floor. This forces the pelvic contents closer to the perineum.

Young's table, especially designed for this purpose, gives an excellent position (Fig. 1), but there are special attachments to ordinary operating tables that have been designed by Charles Y. Bidgood, Arthur B. Cecil and others, which suffice.

2. *Insertion of a Sound in the Urethra.* A No. 20 sound, with a fairly long beak, is passed well beyond the sphincter into the prostatic urethra and held there by an assistant. This is subsequently used to delineate the membranous urethra, and act as a guide for the urethrotomy.

3. *A Curved Perineal Incision.* The incision for the radical operation is about 2 cm. longer on each side than that used for benign hypertrophy. It is in the form of an inverted "U" (Fig. 2), passes across the perineum about 3 cm. in front of the rectum, then curves down on each side, keeping an equal distance away from the rectum, more or less parallel to the ischiopubic rami. The subcutaneous fat and fascia are divided. The "U" shaped flap is

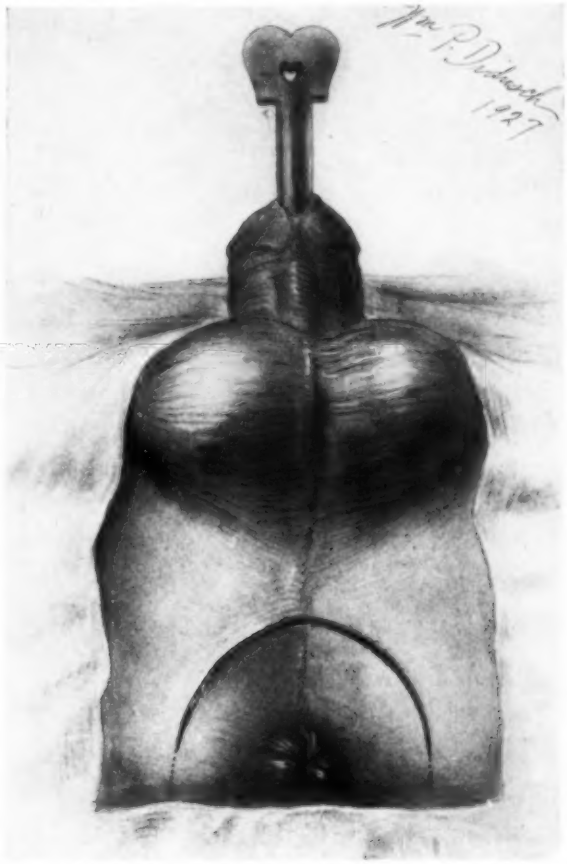

Fig. 2. Young's perineal prostatectomy skin incision. Dotted lines show lengthened incision used in radical operation for carcinoma of prostate and tuberculosis of seminal vesicles. Note sound in urethra.

drawn backward with a clamp, and attached to a towel posteriorly by means of a clip.

4. *Opening of Space on Each Side of Central Tendon, Triangular Ligament and in Front of Levator Ani Muscles with Finger and Handle of Scalpel.* Behind the recto-urethralis muscle, external to the central tendon, and in front of the levator ani muscle, is a space which can easily be opened up by blunt dissection (Fig. 3). The selection of the proper point to insert the finger is very important. With the posterior flap turned backward, palpation will readily indicate the site of the bulb, the transversus perinei muscles on each side, the central tendon leading from

the bulb to the sphincter ani. This point is about 1.5 cm. in front of the anterior margin of the anus, and 2 cm. from the

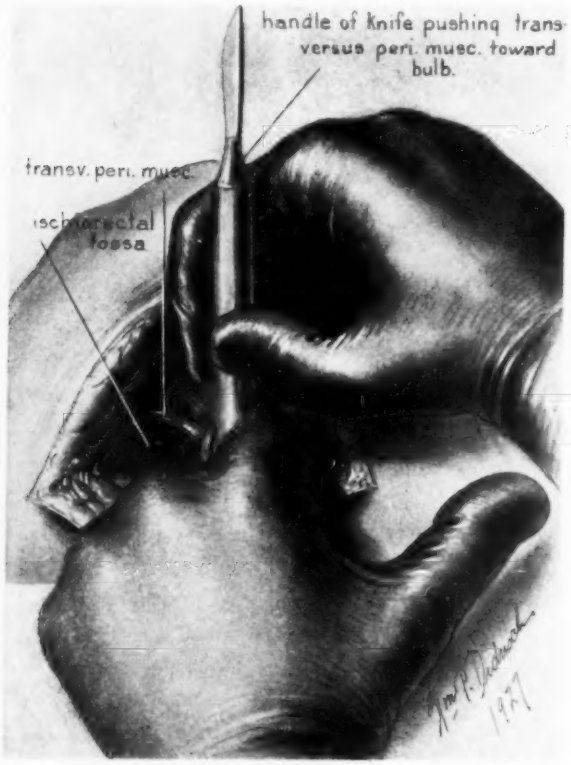

Fig. 3. Showing opening-up of fossa on each side of central tendon and back of transversus perinei and triangular ligament on left side. This has already been carried out on right side.

median line. One has little difficulty in pushing the index finger slowly into this space. The use of the handle of a scalpel is of much assistance in this maneuver, and makes it possible to be certain that the space opened up is definitely behind the transversus perinei muscles on each side, and the triangular ligament deeper down. The finger should be directed slightly upward and away from the rectum, which we have thus never found any difficulty in avoiding.

In a recent report by W. W. Scott he has shown that inexperienced operators have torn into the rectum, evidently by directing the blunt dissection somewhat inward and towards the rectum instead of upward and outward. The operator must make certain the blunt dissection is behind the transversus perinei muscles by feeling resistance with the handle of a scalpel. He then may well insert the bifid posterior retractor, each blade of which enters

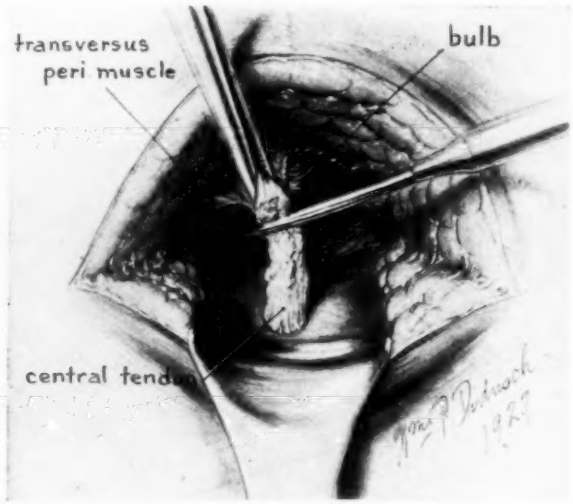

Fig. 4. Rectum held back by bifid retractor puts central tendon on tension. It is shown being divided close to bulb and well away from rectum.

deeply into the space opened up. Traction carries the rectum backward, and puts the central tendon on tension.

5. *Division of Central Tendon.* This so-called tendon is really a fairly broad, deep band of muscle, which should be divided well in front of the external sphincter, and back of the bulb (Fig. 4), so as to avoid hemorrhage. It can often be separated from the rectum by the handle of a scalpel before division, if one cares to be doubly sure of avoiding rectal injury. By blunt dissection structures are freed on each side, and after perhaps a little more division of tissues in median line, being careful to have the rectal sphincter in sight and avoid it.

6. *Isolation and Division of Rectourethralis Muscle; Exposure of Membranous Urethra behind External Sphincter.* By blunt dissection on each side one then recognizes the rectourethralis muscle as a prominent central ridge, which runs from the membranous urethra to the rectum (Fig. 5). This is probably the most important moment of the operation. It must not be divided too far upward, else the external sphincter may be cut. It must not be divided too far backward, or the

rectal muscle may be injured. By palpating upon a sound within the urethra beneath and using ordinary care, no difficulty is

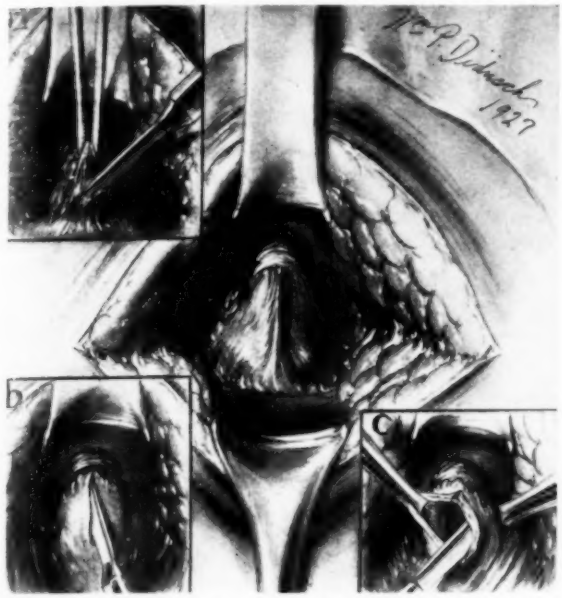

Fig. 5. Exposure of rectourethralis muscle (centre). *a*, Its division. *b*, Urethrotomy. *c*, Elevation of cut edges of urethra.

experienced in dividing this muscle (Fig. 5, a) and exposing the membranous urethra behind the external sphincter. Then, and not until then, is the anterior bulb retractor inserted. This retractor contains a notch so that it encircles the urethra closely and when traction is made, the external sphincter is drawn forward out of the operator's way, thus exposing 1 to 2 cm. of membranous urethra freed from muscle. With the handle of the scalpel the tissues are pushed back a short distance, exposing the apex of the encapsulated prostate.

7. *Median Line Incision into Membranous Urethra and Insertion of Prostatic Tractor, Which is Then Opened Out, Making Traction upon Prostate.* The operator makes certain the external sphincter is drawn upward out of the way (Fig. 5), and that a plain retractor, which is replaced by the bifid retractor, draws the rectum backward (Fig. 5). He palpates the sound through the thin membranous urethra, and then makes a median incision (Fig. 5, b), picks up the edge of the urethral wound on each side with an Allis clamp (Fig. 5, c), being careful to see that the mucosa is

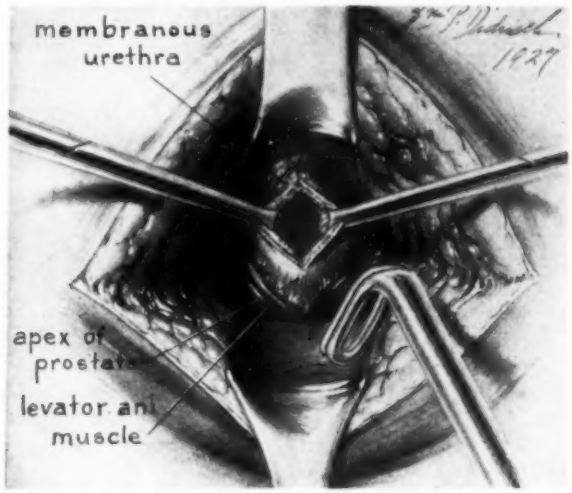

Fig. 6. Urethrotomy wound at apex of prostate well back of external sphincter in membranous urethra is held open by Allis clamps previous to introduction of prostatic tractor.

included, then partially withdraws the sound from the urethra and inserts a straight sound through the urethrotomy wound into the bladder. If the urethra is contracted, the operator inserts a glove stretcher to enlarge it, then introduces either Young's curved prostatic tractor (Fig. 6) into the bladder, or if difficulty is encountered, a straight prostatic tractor. In carcinoma of the prostate there is apt to be a marked contracture of the vesical orifice, and dilatation may be necessary. Sometimes difficulty is experienced in inserting either a curved or straight tractor, but one ultimately succeeds. We have recently found it advantageous to have a smaller, non-fenestrated prostatic tractor (Fig. 7), with shorter blades. We have found this preferable to the larger fenestrated instrument.

8. *Exposure of the Posterior Surface of the Prostate and Confirmation of Diagnosis.* Making traction upon the instrument, which has been introduced through the urethrotomy wound, the posterior surface of the prostate is next exposed. Great care should be taken to go through the posterior layer of Denonvilliers' fascia, lest the rectal

wall be injured, and not to go through the anterior layer, lest the carcinomatous prostate be invaded. It is usually necessary

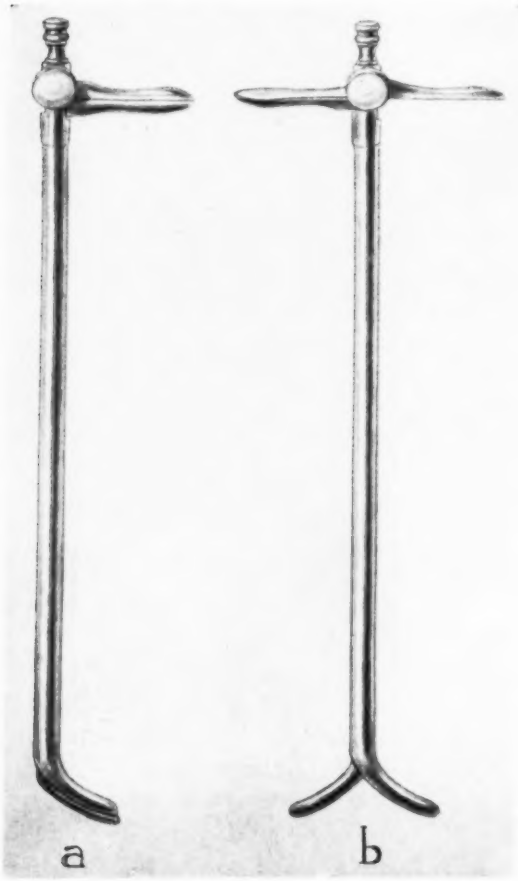

Fig. 7. Prostatic tractor with short, non-fenestrated blades used in carcinoma of prostate, and also in vesicovaginal fistula operations.

to divide a few fibers of the posterior layer of Denonvilliers' fascia on each side of the urethrotomy wound. By blunt dissection this is pushed back (Fig. 8, a), and one recognizes at once the pearly white coverings of the prostate, the anterior layer of Denonvilliers' fascia, which in fetal life was peritoneum. It is easily recognized by its pearly white and somewhat shiny appearance. Following the line of cleavage between two layers of fascia, the rectum is gradually pushed back, and the posterior surface of the prostate completely exposed (Fig. 8). A special tractor with a blunt edge is then inserted in front of the posterior layer of fascia, the levator ani muscles and perirectal muscle. Backward traction of these structures affords an excellent view of the posterior surface of the prostate. Careful examination is then made to

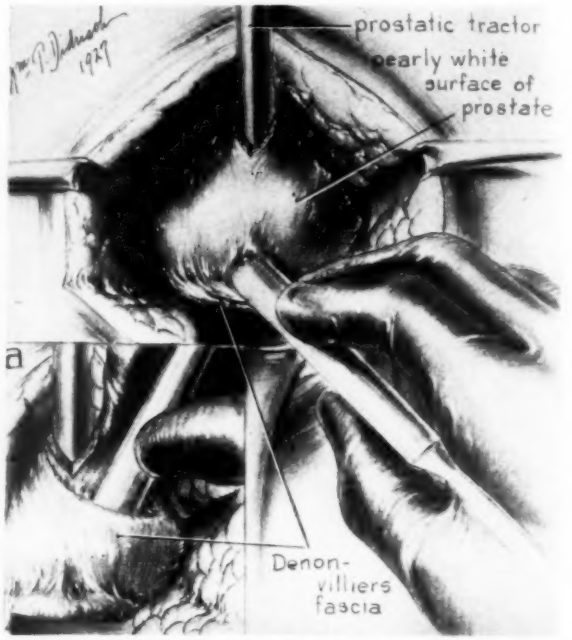

Fig. 8. Exposure of posterior surface of prostate covered by anterior layer of Denonvilliers' fascia. In *a* this fascia is shown in process of being stripped back by handle of knife from posterior capsule. In main drawing stripping is completed and prostate, drawn down by tractor, is prepared for incision.

discover, by palpation, the markedly indurated area within the prostatic capsule on which the diagnosis was made. As a rule, the marked induration (third degree) makes the operator certain of his diagnosis. One should then proceed to determine that the carcinoma has not extended beyond the limits of the radical operation; i.e., has not invaded the region of the seminal vesicles nor the membranous urethra, has not passed through the capsule of the prostate towards the rectum, or in any other region; in fact, lies well encapsulated. If, on palpation, the operator is still uncertain whether or not carcinoma is present, an incision may be made and the diagnosis confirmed by the appearance of the cut surface. Marked induration, yellowish dots and lines, etc. immediately make it advisable to take out a section for better inspection, or frozen section. Microscopic diagnosis can usually be returned in

eight or ten minutes. Great care must be taken in making this frozen section. The tissue should be previously hardened for

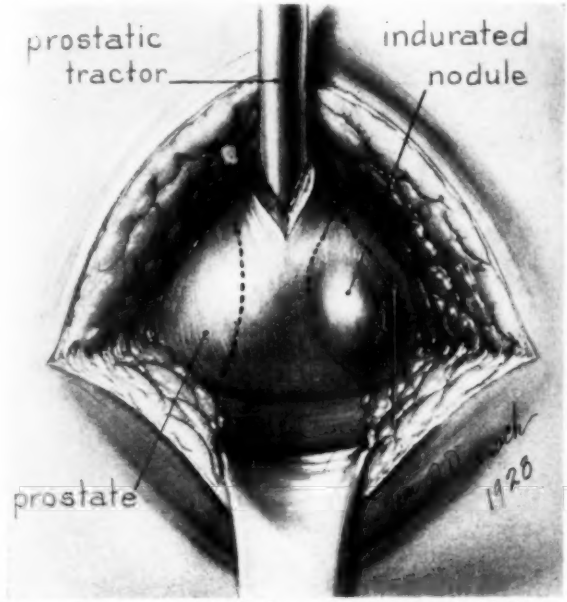

Fig. 9. Prostate exposed through perineum and drawn downward by tractor introduced through membranous urethra into bladder. Indurated nodule in right lobe suspicious of cancer. Excised (dotted lines) for frozen section and microscopic study. Proved to be malignant; radical operation carried out. If it had been shown to be benign, prostatectomy would have been done through bilateral capsular incisions.

a brief time, then carefully cut and stained. In a few instances mistaken diagnoses have been made by supposed experts. If the suspicious indurated area is in the form of an isolated nodule, and the operator is uncertain that it is carcinoma, the whole thing may be excised with an area of supposed healthy tissue (Fig. 9), and again examination of cut surface, frozen section, etc. be carried out. In such a case the radical operation may not be necessary, as will be discussed later on. If the decision is against carcinoma, the usual perineal prostatectomy is carried out, but if the diagnosis is carcinoma, the radical operation is performed.

9. *Exposure of Posterior Surface of Seminal Vesicles.* To accomplish this, blunt dissection between the anterior and posterior layers of Denonvilliers' fascia is continued far backward, exposing the seminal vesicles covered by the anterior layer. A deep retractor without a lip is introduced posteriorly. The vesicles are

Fig. 10. Young's radical operation for prostatic cancer; anterior fascia is stripped from prostate (center). *a*, Membranous urethra divided. *b*, Anterior surface of prostate exposed to vesicoprostatic juncture.

thus easily exposed, and palpation again carried out to be sure the carcinoma has not extended into the vesicles beyond the limits of the proposed excision. The operator then frees the sides of the seminal vesicles, and continues forward, freeing the portion of the lateral wall of the prostate, being careful to keep well outside the fascia covering it. Bleeding points should be carefully picked up and ligated.

10. *Division of Membranous Urethra below the Prostatic Juncture.* The tractor within the bladder is then drawn backward (Fig. 10), putting the anterior membranous urethra on tension. The scalpel passes transversely through this (Fig. 10 a), until the urethra has been completely divided. This leaves a cuff of urethra attached to the apex of the prostate, and a portion with the external sphincter intact below. As soon as the scalpel is passed through the mucosa, attention is directed to one lateral wall of the prostate, where it

is joined by the fascia externally, as shown in Figure 10. The fascia which comes from the lateral wall of the pelvis divides,

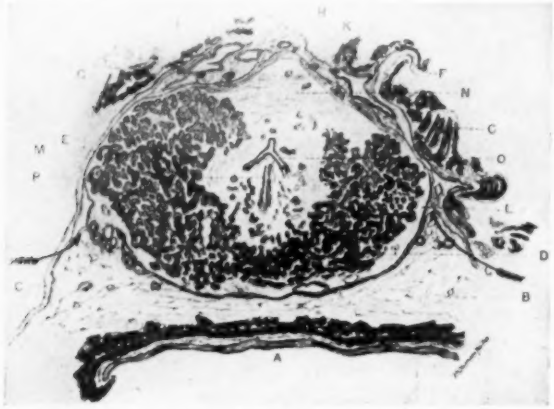

Fig. 11. Transverse section of prostate and surroundings at level of verumontanum. Anterior surface of prostate shown uppermost. Arrows indicate point at which anterolateral fascia should be reflected from prostate.

one leaf passing posterior to the prostate, and one anteriorly (Fig. 11). In front of this anterior leaf are the blood vessels and nerves (Fig. 11) which course downward to reach the triangular ligament, the perineal structures including the external sphincter. By preserving these, I have shown that incontinence is prevented. It is, therefore, desirable to keep beneath this anterior fascia, and yet external to the capsule of the prostate anteriorly (Fig. 10, b). If carcinoma has progressed towards this region, it is wise not to attempt to preserve the fascia, but to dissect more radically. In the majority of cases, however, it is safe to keep beneath this fascia until the posterior wall of the bladder is reached at its juncture with the prostate. During this blunt dissection the posterior surface of the encapsulated prostate, as well as the anterior surface is thoroughly exposed.

11. *Transverse Incision into Bladder at Vesicoprostatic Juncture.* The bladder wall at a point close to the prostate is grasped by a double tenaculum forceps, which penetrates deeply into the bladder. A stab wound is then made into the vesical cavity, and enlarged on each side (Fig. 12, a). Scissors are then inserted, dividing the vesical mucosa close to the prostate on each side. Bleeding points will be encountered and must be clamped and ligated.

12. *Insertion of Long Anterior Retractor*

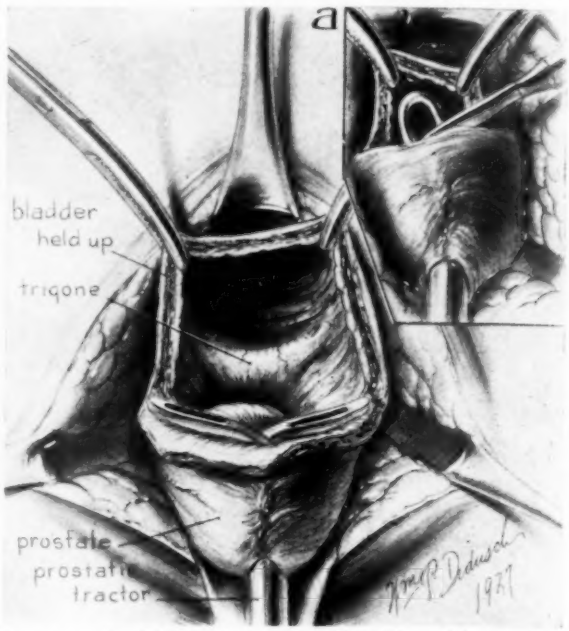

Fig. 12. *a*, Incision at juncture of bladder with prostate anteriorly. In central picture, exposure of trigone is shown.

into Bladder, Exposing Trigone, Ureteral Ridges and Orifices. A deep retractor is then placed anteriorly into the bladder (Fig. 14, b). Traction upon this draws anteriorly against the symphysis pubis and exposes the interior.

13. *Continuation of Division through the Bladder Wall, across Trigone just below Ureteral Orifices.* With the interior of the bladder thus exposed, the trigone, ureteral ridges and orifices are recognized, and incision carried across the trigone (Fig. 13) about 1 cm. below the orifices and downward to the lateral wall on each side, thus cutting the bladder entirely off from the prostate. The bleeding points are clamped and ligated.

14. *Exposure of Anterior Surface of Vesicles and Ampullae by Pushing Bladder Upward.* The division through the trigonal tissue should be sufficiently deep to expose the anterior surfaces of the seminal vesicles and ampullae (Fig. 14), which are uncovered by pushing the bladder upward with a Küttner dissector.

15. *Isolation, Clamping, Ligation and Division of Vasa Deferentia above Ampullae.* This carries the ureters away from the

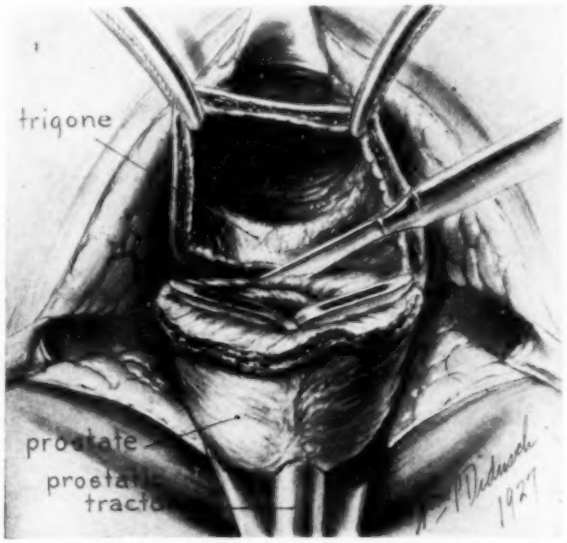

Fig. 13. Division across trigone completing separation of bladder from prostate.

wound, and exposes both vesicles and ampullae. These are then palpated, picked up on curved hooks (Fig. 14, c), clamped at a point 5 or 6 cm. above the prostate, divided and ligated (Fig. 14, d).

16. *Exposure of Vascular and Fibrous Pedicle of Vesicle, Clamping, Division and Ligation.* By blunt dissection the pedicle of the left vesicle is freed, then isolated as high as possible, so that one or two curved clamps can be placed across it well above the tip of the vesicle (Fig. 14, d). Division is then made, avoiding the vesicle, which is thus liberated, drawn out of the way, so that a ligature can be placed across the pedicle clamp.

17. *Same Procedure on Opposite Side.* Little difficulty is then experienced in isolating completely the right vesicle, and its fibrovascular pedicle. A curved clamp is then placed as high up as possible, and division made well above the tip of the vesicle. Placing of a ligature completes the deep dissection.

18. *Removal of Entire Prostate with its Capsule, Entire Urethra, with a Portion of the Membranous Urethra, Cuff of Bladder, Both Seminal Vesicles, and Ampullae of Vasa in One Piece.* This has been accomplished by the technique already described, and has been carried out without much

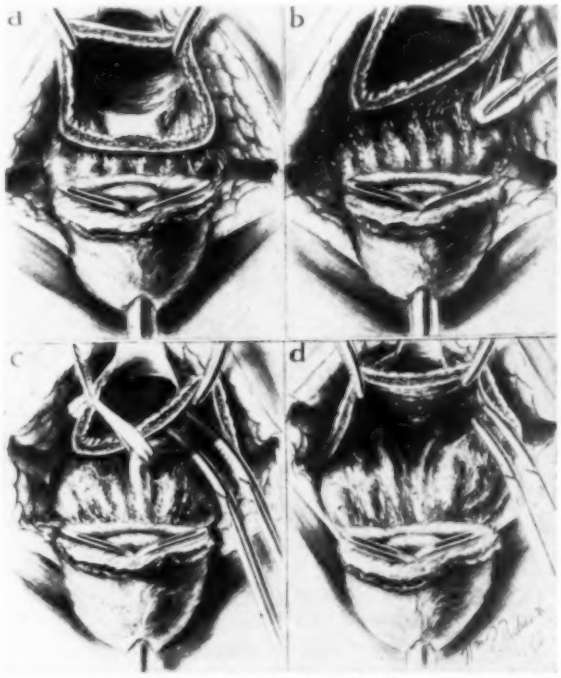

Fig. 14. *a*, Trigone divided. *b*, Bladder stripped up from vesicles and vasa which are ligated (*c*). *d*, Pedicles divided.

difficulty in all our cases. Never has it been necessary to remove portions piecemeal, and excellent results obtained have been due to the fact that the dissection has been so extensive as to include everything from the mid-portion of the membranous urethra to the tips of the seminal vesicles, most of the trigone, vesical neck and the entire capsule of the prostate with it (Fig. 15).

19. *Careful Arrestation of Hemorrhage.* The operative specimen having been removed, a careful inspection is made to be sure that there are no important bleeding points, and plans made for anastomosis and final closure.

20. *Insertion of a No. 20 Rubber Catheter through the Urethra and out the Stump of the Membranous Urethra.* Preparatory to the anastomosis, a rubber catheter is inserted (Fig. 16) through the urethra for vesical drainage.

21. *Anastomosis of Membranous Urethra and Bladder.* A portion of the anterior

wall of the bladder is used for anastomosis with the urethra. Interrupted chromic catgut sutures are placed with Young's boomerang needle holder (Fig. 16), the knots being tied externally. This is well shown in Figure 16, a.

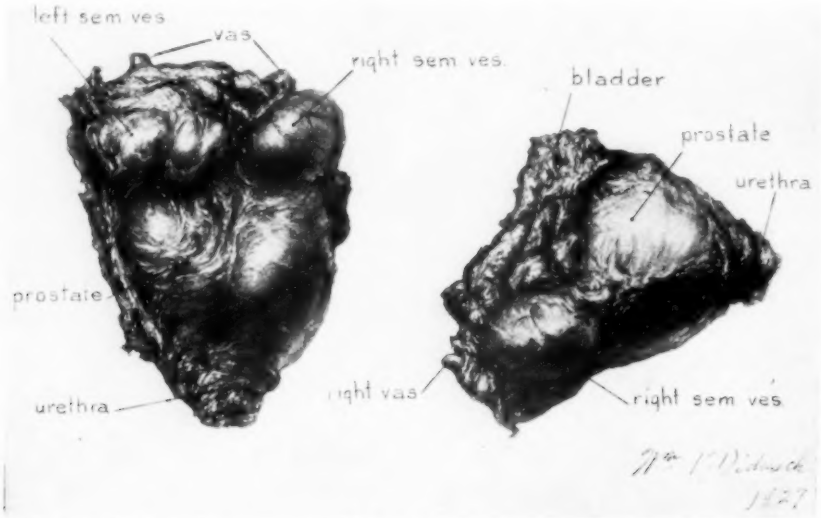

FIG. 15. Drawings of operative specimen removed in my first case. Portion of membranous urethra completely encapsulated prostate, large cuff of bladder and trigone, both seminal vesicles and 5 cm. of vasa deferentia having been removed in one piece.

22. *Closure of Remaining Vesical Wound.* About one-third of the open end of the bladder is used in the anastomosis, after which there remains a longitudinal wound to be closed (Fig. 17). It is best to begin posteriorly, and place the sutures with the boomerang needle holder, so as to be sure not to include the ureter on each side, turning the trigonal tissue in at this point (the illustration is vice versa). Below this the wound is approximated by continuous sutures, which do not include the mucous membranes, but approximate the muscle. The technique of anastomosis is not difficult, and excellent approximation of bladder and stump of the membranous urethra has been effected in all cases. There has never been a break-down of this anastomosis nor a single case of post-operative stricture. It has rarely been necessary to pass a sound.

23. *Light Rubber Drains to Each Corner of the Deep Wound.* It has been found wise to insert a delicate tube into each of the deeper corners of the wound (Fig. 17, a). In a few instances there has been enough bleeding to require a hemostatic pack, but in only one case in which this radical operation was carried out for carcinoma was there postoperative hemorrhage of any moment.

24. *Approximation of Levator Ani Muscles.* This is approximation of levators is desirable in order to buttress the rectum (Fig. 17, a) and to prevent its rubbing against the drains.

25. *Drains Brought Out through the Right Angle of the Wound.* The remainder of the skin wound is approximated with deep through-and-through sutures of waxed silk (Fig. 17, b) which close the anterior and left lateral angle of the wound.

26. *Catheter, Draining Bladder, Fastened in Urethra.* Before completing the anastomosis of the bladder to the membranous urethra, the operator makes certain the end of the catheter is inserted deep enough to be well above the trigone, so that its tip cannot press against the vesical wound. In one of our cases, in which this was not done, a catheter was stiff enough to force its way through the sutured wound and to wear a hole through the rectum within a week after the operation. We must be certain, therefore, that the catheter has been properly placed, and the

bladder washed clean, before the anastomosis has been completed. The catheter is fastened to the shaft of the penis with

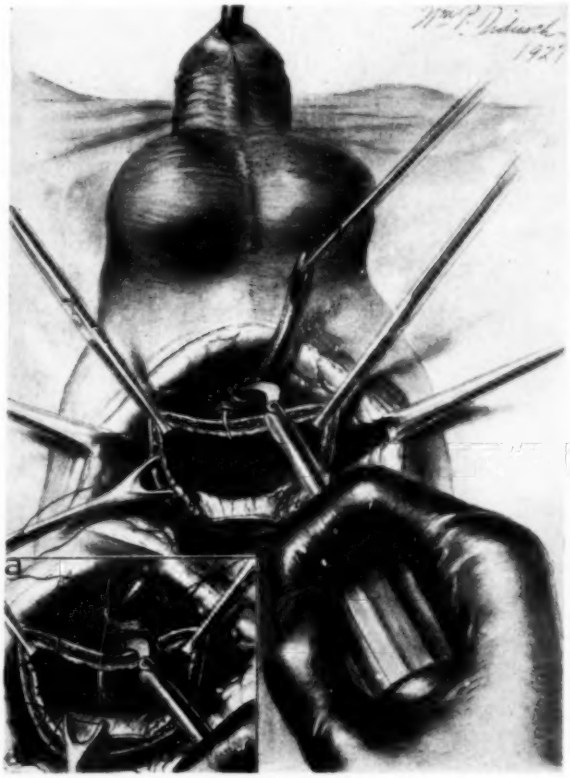

Fig. 16. Anastomosis of bladder to urethra with boomerang needle holder.

sterile adhesive tape, and subsequently connected with a vacuum drainage apparatus.

27. *Postoperative Care.* If the patient is in good condition, little or no shock follows the operation, as outlined. In some cases it may be desirable to give an infusion of salt solution or 5 per cent glucose intravenously during the operation, and in rare instances a blood transfusion has been given at the end of operation. On return to the ward, the patient is invariably given a subcutaneous infusion of salt solution. This may be either submammary or beneath the fascia lata of the thigh. If the patient is shocked, 5 per cent glucose into one of the veins of the foot or ankle is sometimes given. In rare instances have we resorted to blood transfusion. It is very important to avoid shock, and to have the patient take water in considerable amount as soon as feasible. The convalescence is usually more simple than after an ordinary operation for

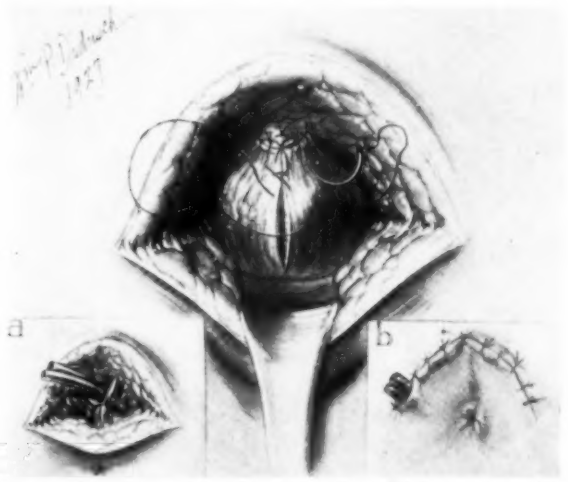

Fig. 17. Anastomosis of stump of membranous urethra to bladder. Closure of remaining wound posteriorly. *a*, Rubber drains emerging; approximation of levator muscles behind them. *b*, Final closure.

benign prostatic hypertrophy, because the suturing is complete, and no prostatic cavities remain to be healed. I cannot remember a single case of persistent urinary fistula, and the discharge from the hospital is generally within four weeks. The urethral catheter is generally removed on the seventh or eighth day, and rarely has it been necessary to reinsert it. It has been the rule not to pass sounds, and only rarely have they been employed. The simplicity of the convalescence after the operating day is one of the remarkable features of this operation, and as remarked by George Gilbert Smith, even though there be a recurrence, it generally recurs as a remote metastasis, and the patient is not bothered with carcinoma within the urethra and bladder.

GENERAL CONSIDERATIONS

Careful Selection. Cases which are usually satisfactory for the radical operation are those in which the carcinoma is well within the capsule of the prostate. In our series we have had a carcinomatous nodule no larger than the head of a pin (Fig. 18). In several instances the nodule was little

larger than the size of a pea. In all of these cases the nodule was in the posterior lamella of the prostatic tissue just beneath

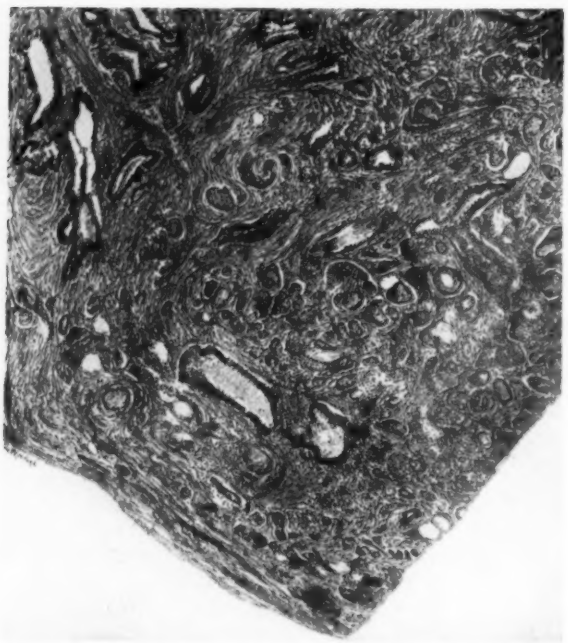

Fig. 18. Photomicrograph showing small carcinoma nodule about 2 mm. in diameter; posterior to benign hypertrophy. Some of normal acini still persist in cancerous area.

the posterior capsule. In some cases it was prominent; in others, it lay as an extremely hard, round mass in the prostatic tissue. A careful study of our 49 radical cases shows that in all carcinoma was in the posterior lamella or lobe of the prostate. Our studies over a period of many years have shown that it generally begins in this portion. The progress is often slow. We have watched one patient who refused operation for three years, and the nodule increased slowly from one of about 1 cm. in diameter to 2 cm. in size in that time (Fig. 19). In other cases the pathologic process grows much faster and the entire prostate becomes involved, but owing to the marked encapsulation of the prostate, it rarely progresses to the membranous urethra or triangular ligament, or to the rectum. The growth is usually upward beneath the capsule and anterior layer of Denonvilliers' fascia which covers the prostate and vesicles closely, and ultimately reaches the region around the structures and back of the bladder. When it is palpable, well above the prostate, even though the upper portion of the seminal vesicles seem uninvolved, the chances of radical cure are not good. Where a line of induration extends upward and outward, and particularly if any enlarged glands are felt well out along the pelvic wall, the prognosis is also very bad. In such cases a radical cure can not be expected. Metastases to the bones of the pelvis and spine are important to recognize. In about 61 per cent of our cases the carcinoma of the prostate has occurred in patients who also had adenomatous hypertrophy of the lateral and median lobes. In many of the cases the carcinoma occupies only the posterior lobe or lamella, while there is an hypertrophy of the lateral and median portions in front of the carcinoma. They frequently are present adjacent to each other without the adenoma being involved in the carcinomatous process. This accounts for the fact that suprapubic prostatectomy may result in complete enucleation of the lateral and median lobes, and relief of the obstruction, and although the specimen shows no evidence of malignancy the patient dies of carcinoma. The posterior layer of carcinoma separated from the lateral lobes by the encapsulation is often not suspected by the suprapubic operator. We have specimens which show that the carcinoma has invaded the capsule of a hypertrophied lobe. Eventually it replaces the benign tumor with malignant cells. At the same time the lobulated or spheroid appearance of the adenoma is preserved in its carcinomatous replacement. When on rectal examination a marked indurated nodule or area in the prostate is discovered, especially if it is third degree induration; i.e., very hard, one should be suspicious of carcinoma. An *x*-ray of the prostate should be taken to rule out calculi and bony metastases, and the prostatic secretion should be studied microscopically to see whether a chronic inflammatory proc-

ess is present. Chronic inflammation may indeed produce almost as great induration as carcinoma, but it is usually more impossible to make a positive diagnosis before operation, and the procedure described under Section 8 should be utilized

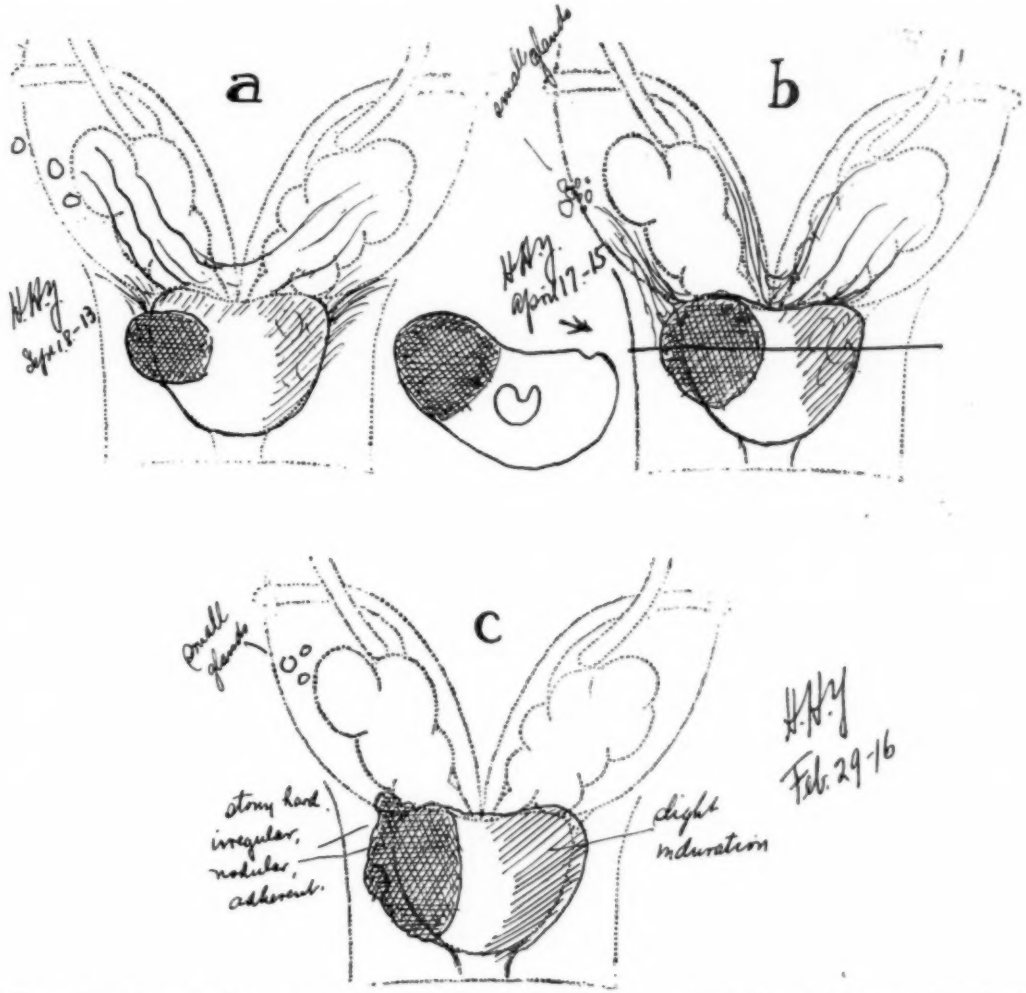

Fig. 19. Case of carcinoma of prostate extremely slow in its development, as shown in successive charts made over period of three years.

generalized, often not associated with any enlargement, and can usually be differentiated by palpation from carcinoma, which is usually harder and more localized at the beginning. Even if the nodule is small, the carcinoma should be suspected. In several cases I carried out hemiprostatectomy (Figs. 21, 22, 23). When the induration is very great, and if calculi, carcinoma and inflammation have been excluded, such cases should be subjected to an exploratory operation through the perineum in order that no opportunity to cure early cases of carcinoma be missed. In some instances it is at operation to determine just what should be done. Having determined that the case is propitious for the radical operation, it is carried out by my technique previously described.

Preoperative Care. This is very much the same as in cases of benign prostatic hypertrophy. A careful study of the cardiovascular system, blood chemistry, renal function tests, etc. are routine. A determination of the residual urine, and cystoscopy should also be carried out, generally with the posterior cysto-urethroscope in order to view the prostatic urethra, and detect intraurethral malignant

outgrowths. At cystoscopy it is very important to determine whether the subtrigonal tissues are involved, and if so,

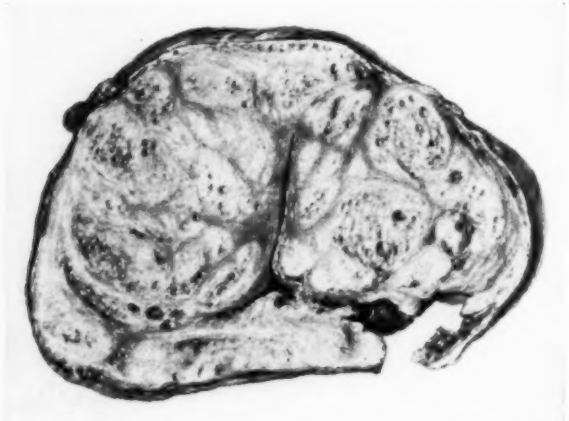

Fig. 20. Case of carcinoma occupying posterior lobe or lamella with hypertrophy of lateral lobes. Defect in posterior surface shows where section was made for diagnosis before carrying out radical operation.

whether they extend more than a short distance above the vesical orifice. Where the upper portions of the trigone are seen elevated, showing submucous invasion, radical operation is contraindicated. It is a remarkable fact that except late in the disease carcinoma rarely breaks through the mucosa, either of the urethra or the bladder. As benign hypertrophied lobes are present in 60 per cent of the cases, their discovery on cystoscopy should not be interpreted to mean that the case is benign. A most important diagnostic aid is to insert a finger in the rectum while the cystoscope is in the urethra, with the beak turned downward, and palpate the trigone, subcervical portion of the prostate, and the lower prostatic urethra. Marked induration and increase in the thickness is to be noted, and where there is a nodule or hard area in one lateral lobe, here is an excellent opportunity to determine the character of the induration present.

The usual preoperative care for disturbances of the cardiovascular system, impaired renal function, etc. has been carried out, and the operation performed only when the condition of the patient has reached an optimum condition.

Operative Aids, etc. I have found spinal anesthesia of great value. It is rare for the patient to suffer pain, except when the

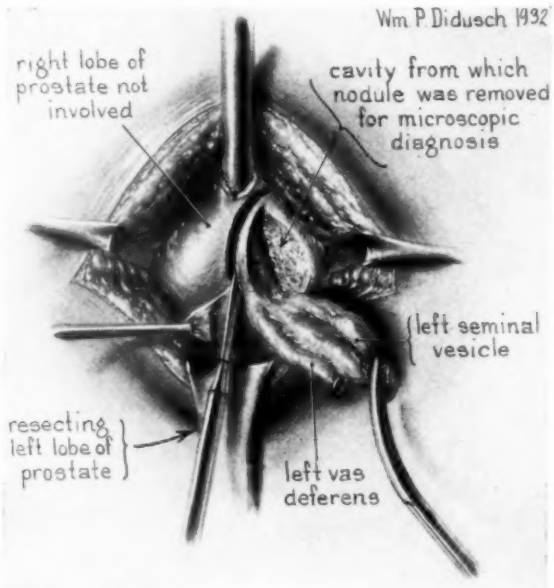
Wm P. Didusch 1932
right lobe of prostate not involved
cavity from which nodule was removed for microscopic diagnosis
left seminal vesicle
resecting left lobe of prostate
left vas deferens

Fig. 21. Removal of half of prostate and seminal vesicle and ampulla for localized carcinoma of portion of lobe of prostate. Diagnosis confirmed by excision of nodule and microscopic study.

deeper portions of the seminal vesicles and pedicles are reached. At this point it may be desirable to make an injection of ½ per cent novocaine into the deep tissues. In almost all cases, it has been possible to carry out the entire radical operation under spinal anesthesia. Unless the patient is weak or aged, or the hemoglobin is low, blood transfusion is usually not required, if the operator is careful to have good hemostasis. In some cases where this is difficult, it may be desirable to give an intravenous injection of 5 per cent glucose, or to follow this with a blood transfusion from a well-matched patient in order to prevent some shock. It is much better to give an unnecessary transfusion than to take a chance of incurring a dangerous shock. An infusion, submammary or beneath the fascia of the thigh, is done on the return of the patient to the ward in all cases, and early drinking of water in copious amounts is encouraged to keep the kidneys active and to support the cardiovascular system.

Postoperative care has been dwelt with quite fully in Section 27.

End-results, and Experiences of the Author with the Method. In a chapter on "Malignant Diseases of the Prostate" which appeared in Lewis' System of Surgery, the author gave in great detail all the case histories of carcinoma of the prostate in which the radical operation was carried out. Since then there have been more cases and a questionnaire has been sent to all the living patients, and where possible, they have been asked to return for examination.

Our studies of these cases show that the prognosis of a radical cure, which was expressed in our early papers, has been confirmed. In the early operations, incontinence of urine invariably occurred, but since we have adopted the technique of preserving the anterior layer of fascia, which crosses the pelvis in front of the prostate, the majority of these cases have had excellent urinary control, and a few in which there is some diurnal incontinence, experience no such trouble at night. In some cases it is necessary to sacrifice this anterior fascia in order to make the operation more surely radical when the disease is close to the anterior surface of the prostate. Whether the disease has involved the seminal vesicles or not, we have always made it a point to remove them and the ampullae completely. A study of the specimens has frequently shown minute prolongations of the carcinoma which were not recognized beforehand, but were completely removed by the seminal vesiculectomy.

The end-results are, I believe, among the best that have been obtained by radical surgery for carcinoma. This, I believe, is due to the fact that the prostate is a doubly encapsulated organ, and the disease is prevented, by these fascial coverings, from traveling downward or backward to the adjacent rectum. Although an extensive operation, it is not indeed very difficult, and anyone who knows his perineal anatomy and is accustomed to attacking the prostate through that region should have no difficulty in carrying out the operation. I have attempted to confine it to cases which I thought were curable, with the exception of a few where I took a chance, although I realized the extent of the invasion upward, or laterally, might be found too extensive for a radical cure. George Gilbert Smith has found, however, the results of the operation so good that he has boldly used it in cases

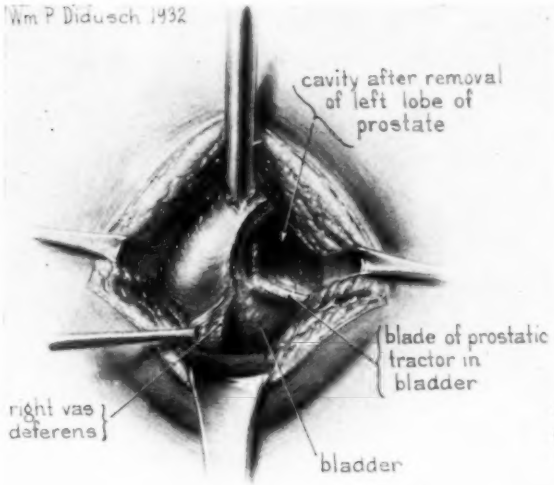
Wm P. Didusch 1932
cavity after removal of left lobe of prostate
blade of prostatic tractor in bladder
right vas deferens
bladder

Fig. 22. Cavity left after removal of left lobe of prostate, left vesicle and ampulla. Ampulla of right vas deferens and right lobe of prostate remain.

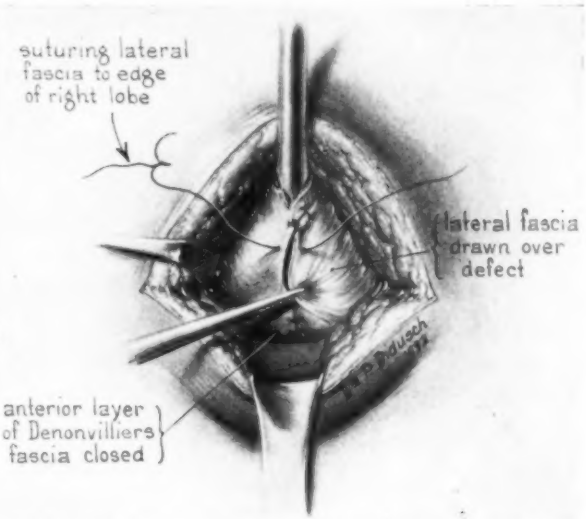
suturing lateral fascia to edge of right lobe
lateral fascia drawn over defect
anterior layer of Denonvilliers fascia closed

Fig. 23. Closure of defect by drawing lateral fascia across area of resection.

of extensive carcinoma in which the disease had already spread beyond the limits of the operation. He states that although these patients die of generalized carcinomatosis, there is usually no local recurrence in the urethra or bladder, and micturition is far more more satisfactory, less frequently accompanied by pain, hematuria, dysuria and recurrence of the obstruction than when some partial operation, such as transurethral resection or partial prostatectomy, is carried out.

An analysis of 42 cases, which we have carefully studied, showed that the average age was sixty-four years; the youngest fifty-one, and the oldest seventy-seven. The predominant symptoms were: frequency, 24 cases; frequency and nocturnal emission, 4; frequency and pain, 2; frequency and dribbling, 2; diminution in size of stream, 2; complete retention, 2; urethral discharge, 1; burning on urination, 1; hesitancy, 1; hematuria, 1; urgency, 1; difficulty in completely emptying the bladder, 1; no complaint, 3.

The average number of days in the hospital was forty-two.

There were 4 deaths in 50 cases, or 8 per cent. In the last 42 cases there were only 2 deaths, a mortality of 4.8 per cent.

Dr. Lloyd G. Lewis has made a careful study in March, 1935, of the ultimate results in 50 cases, and reports: There are 33 patients, who left the hospital after the operation over five years ago. Of these 16, nearly 50 per cent, lived or are living five years without a recurrence. Thirteen patients lived over seven years without a recurrence. Nine have died of old age, or intercurrent disease, without having had recurrences. Twenty-three are still alive without recurrences. Recapitulating, 4 died in the hospital, 2 have not been followed, 9 died without recurrence or metastases, 11 died with recurrence or metastases. One is living with recurrence. These total 27 cases. Excluding these there are 23 living without metastases, or 52 per cent. Patients alive and well: one twenty years, 2, thirteen years, one eleven years, one ten years, 3 nine years, and one each eight, seven and six years respectively. In some of the cases included in the table of 50 cases, there are several in which the disease had progressed so far that radical operation could not hope to offer permanent relief. If these were excluded, the percentage of five year cures would be much higher. Although many of the patients were quite old, those living without recurrence or metastases have lived now an average of seven years since operation.

CONCLUSIONS

The object of this paper is to show that the early diagnosis of carcinoma is generally easy. A very hard nodule or area palpable by rectum, unless shown by *x*-ray to be calculus, should be looked upon with grave suspicion. In such a case the patient should be subjected to perineal operation at which the lesion is seen, palpated, and if necessary, an area incised and studied microscopically. When the diagnosis is confirmed, my radical operation can be performed with a prospect of radical cure in probably 75 per cent of the cases. If general practitioners could be taught to make rectal examinations much more frequently, and be suspicious of every markedly indurated prostate, even when only a small nodule is present, many patients would be brought to early radical operation and ultimate cure.

CYSTOSCOPIC CONTROL BY RADIUM OF BLADDER CANCER

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OVER thirty years ago Nitze revolutionized the treatment of bladder papilloma by conclusively proving that cauterization of these tumors through the cystoscope was quite as affective as the operative removal through the suprapubic incision. Comparable to this is the present-day situation with regard to small bladder cancers.

We have in the Memorial Hospital records a series of 36 cases of bladder cancers of grades of malignancy II, III and IV which have been controlled by radium applied through the cystoscope.

The longest case has gone nearly twenty years in a patient now ninety years of age.

The table of the length of control, dating the time of control from the time when the patient was first seen is shown in Table I:

TABLE I
LENGTH OF CONTROL

Less than 1 year	1 to 2 years	2 to 3 years	3 to 4 years	4 to 5 years	5 to 10 years	10 to 15 years	15 to 20 years
6	2	2	1	5	13	6	1

This is an impressive series.

We believe in cases properly chosen that the cystoscopic application of radium affords quite as valuable a possibility of cure as does the suprapubic approach. This method has been used in patients who are poor or impossible operative risks because of old age or concurrent diseases; heart disease, kidney disease and diabetes stand out prominently in the latter. There is no mortality to the procedure. This should recommend it both to the patient and the surgeon.

I believe that no other tumor in the body offers the same opportunity to the surgeon to substitute a mild curative non-operative therapy for a somewhat severe operative procedure.

There are in the literature many inaccuracies and many false points of view regarding this procedure. It is said that radium seeds cannot be accurately placed in a tumor seen through a cystoscope. Pictures have been published of very large bladder tumors, obviously much too large for cystoscopic treatment, decorated with a few radium seeds accurately spaced. If the suggested therapy indicated by sketch pictures were followed no bladder tumors would ever be cured. Where one should use perhaps twenty seeds only a half dozen are shown. And there seems to be a somewhat widespread conviction that there is a real danger of puncturing the bladder wall with the radon-bearing needle. I hope to clear up some of these inaccuracies:

I. TYPE OF TUMOR SUITABLE FOR CYSTOSCOPIC CONTROL

Either the small raised papillary tumor or the small flat ulcerating indurated type may be successfully attacked cystoscopically. We have destroyed 29 of the papillary type and 7 of the infiltrating. We know that the infiltrating type penetrates the bladder wall more readily and earlier than the other, but the small indurated tumor may be as easily destroyed cystoscopically as the papillary tumor.

II. POSITION AND SIZE OF TUMOR

If the tumor is in a position in the bladder where the cystoscope reveals it in

its entirety and it is in a position where cystoscopic manipulation can be accomplished then it can be successfully attacked.

If the base of the tumor cannot readily be seen because of the projecting papillary stops.

Fig. 1.

Fig. 2.

Fig. 1. Radon-bearing cystoscopic needle just before it is thrust into tumor.
Fig. 2. Radon seed has been injected from needle into tumor.

We have said that the tumor must be relatively small, not more than 2 or at most 3 cm. across. We have attempted in the last year to attack even larger tumors than this. It is quite surprising what better technique and greater facility in implanting the radon seeds has done in controlling these larger tumors.

Perhaps the largest tumor which we have been able to control had a base of 12 sq. cm. The smaller the base naturally the easier to control are they.

III. TECHNIQUE OF CYSTOSCOPIC IMPLANTATION

The implantation is usually done in men under a low spinal anesthesia. In women this is usually not necessary. The one element which disturbs the cystoscopic implantation is bleeding. There may be absolutely no hemorrhage when the tumor is first seen through the cystoscope, but after the implantation of one or two radon seeds the bleeding may be such as to obscure the picture and prevent further implantation. Adrenalin used in the irrigating solution usually controls the bleeding admirably; ½ dram of adrenalin is poured into 2 quarts of irrigating solution. This is thoroughly stirred up. After one or two washes with this the bleeding usually portion radon seeds are placed in this part. Perhaps a couple of weeks later this will be found to have sloughed off and the base exposed, then it can be implanted. The number of seeds used at one sitting depends naturally upon the size of the tumor and the ease with which they may be implanted. I have implanted as many as sixteen seeds at one sitting, but usually six or eight are the limit.

There seems to be a rather widespread idea that it is possible to puncture the bladder with the radon-bearing needle. This in my experience is quite impossible as the shank of the needle prevents one from going to any great depth and because of the configuration of the bladder the needle is practically never inserted into the bladder wall at right angles, almost always obliquely. The great cause of failure in the cystoscopic application is the fear of implanting too many seeds and implanting them too close together. It really makes no difference if the seeds are implanted side by side, the slough and destruction are only a little greater.

We use seeds of 1½ mc. each, gold screened.

The firmer the tumor is the more easily is the implantation made. Sometimes it is impossible to implant seeds if

the tumor is what might be called loosely papillary. The loose papillary structure will not retain the seeds. In these cases 14 being of Grade II; 3 being of Grade III and 2 being of Grade IV malignancy. The Grade III at the Memorial Hospital

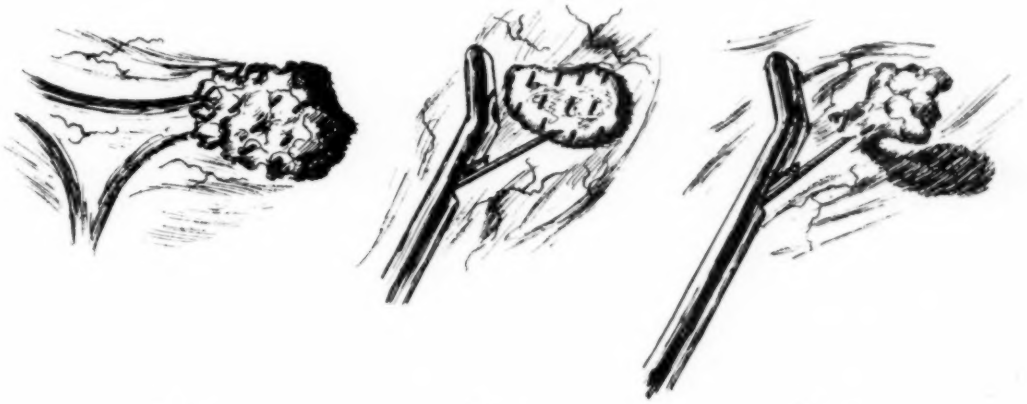

Fig. 3. Fig. 4. Fig. 5.

Fig. 3. Number of radon seeds necessary to control a papillary tumor whose base is 4 × 2 cm.
Fig. 4. Number of radon seeds necessary to control an indurated tumor 4 × 2 cm.
Fig. 5. Seeds implanted in base of a papillary tumor. If base can be seen, that is first attacked.

unscreened radium in a cystoscopic holder is used and held up against the tumor for varying lengths of time. The maximum amount of radium that this holder can contain is about 300 mc. This unscreened radium is very efficacious in the papillary type but must be used with much discretion, as pain and sloughing follow its use. We rarely hold the unscreened radium against the tumor for more than one hour, so giving 300 mc. hr. at a dose.

The ideal method to use radium in this way would be to have a much larger amount of radium which could be placed in a cystoscopic applicator and screened. As yet we have been unable to devise a cystoscopic applicator of this type, the applicator containing the screened radium being too bulky.

It may take several months to adequately destroy the tumor and cystoscopy should not be done too frequently.

Of the 36 patients who are well for periods varying between one and twenty years, 27 were treated by cystoscopic application alone; 7 were recurrences after the suprapubic implantation of radium and 2 were secondary to cervical carcinoma. 19 of these tumors were graded, corresponds to Grade IV of the Carcinoma Registry, that is, the highest type of malignancy.

Between radium implantations through the cystoscope it is important to keep the bladder as clean as possible by mild acriflavine or mild mercurochrome used as a bladder irrigation. This as a rule prevents calcareous incrustations forming on the destroyed tumor. When these do form they have to be removed through the cystoscope.

Brief case records of the 36 cystoscopically controlled cases follows:

Case I. C. A. G., Memorial Hospital. admitted November 1, 1915, female, aged sixty-nine years. Cystoscopy showed a sloughy, sessile bladder tumor 3 by 3 cm. on left ureter, On January 19, 1916, one bladder tube of radon screened by ½ mm. silver was inserted through cystoscope 800 mc. hr. and applied to tumor. Pathological examination: Alveolar carcinoma. Cystoscopy four and one-half years later showed a normal bladder. In October, 1926, patient, sitting at the supper table, died of heart disease.

Case II. J. A. H., Memorial Hospital, admitted July 31, 1916, male, aged sixty-two years. Cystoscopy showed a sloughy sessile bladder tumor 1 by 2 cm. on left ureter. In

October, 1916, two bladder tubes of radon (1134 mc. hr.) were applied to tumor. On February 20, 1917, two bladder tubes of radon (600 mc. hr.) applied to tumor. Pathological examination: carcinoma. In 1921 the patient had a normal bladder on cystoscopy. Died in 1921 from cerebral hemorrhage.

Case III. P. M., Memorial Hospital, admitted October 2, 1916, female, aged seventy-two years. Cystoscopy showed papillary bladder tumor 2 by 3 cm. on trigone and base. On December 2, 1916, two bladder tubes of radon (1400 mc. hr.) applied to tumor. In March, 1919, bladder tube of radon unscreened (733 mc. hr.) applied to recurrence. Pathological examination: papilloma, infiltrating base. In 1935, the patient is well.

Case IV. A. J. VanW., Memorial Hospital, admitted May 16, 1917, female, aged fifty-nine years. Cystoscopy showed bladder tumor 2.5 by 2.5 cm. in left urethral orifice. On May 22, 1917, two bladder tubes of radon 50 mc. 6½ hr. (650 mc. hr.) applied to tumor. On November 20, 1917, two bladder tubes of radon 49 mc. and 91 mc. for 8 hr. (1120 mc. hr.) applied to tumor. Pathological examination: papilloma with malignant tendencies. On June 23, 1918, cystoscopy showed slough, no tumor. Patient died in December, 1926, from cancer?[1]

Case V. M. E. R., Memorial Hospital, admitted May 21, 1917, female, aged sixty-three years. Cystoscopy showed papillary bladder tumor 2.5 by 2.5 cm. back of right ureter. Two bladder tubes of radon 45 mc. for 7 hr. (630 mc. hr.) applied to tumor. Pathological examination: papilloma with atypical cells. In October, 1923, cystoscopy showed no tumor.

Case VI. H. F. R., Memorial Hospital, admitted June 25, 1917, male, aged sixty-eight years. Cystoscopy showed papillary bladder tumor, extensive, on right bladder neck. Two bladder tubes of radon 50 mc. each (800 mc. hr.) applied to tumor on July 3, 1917. Pathological examination: papillary carcinoma. In 1919 two stones taken from bladder. In 1926 the patient died of old age.

Case VII. M. G., Memorial Hospital, admitted October 8, 1918, female, aged sixty-four years. Cystoscopy showed a pedunculated, firm bladder tumor 2 by 2 cm. back of right ureter; 361 mc. for ⅓ hr. (120 mc. hr.) held against the tumor through cystoscope. This was twice repeated. Pathological examination: epidermoid carcinoma. In May, 1919, the patient was tumor free cystoscopically. In May, 1922, the patient died of cerebral apoplexy.

Case VIII. A. H. C., Memorial Hospital, admitted November 11, 1918, male, sixty-three years. Cystoscopy showed a sloughy bladder tumor on bladder neck more on right side; one bladder tube of radon 111 mc. for 5 hr. (555 mc. hr.) applied to tumor through cystoscope. Pathological examination: cells form malignant epithelial tumor of glandular origin. In May, 1920, operation, cystotomy for bleeding, no tumor, granular cystitis. In September, 1921, patient was in a hospital for the insane.

Case IX. L. W., Memorial Hospital, admitted July 29, 1919, female, aged fifty-four years. Cystoscopy showed a sloughy sessile bladder tumor 2 by 2 cm. on left wall near ureter; two bladder tubes of radon 57 and 58 mc. for 7 hr. (750 mc. hr.) applied to tumor through cystoscope. Pathological examination: epidermoid carcinoma. In 1920 the patient had no tumor on cystoscopy. Lost track of patient.

Case X. H. J. D., Memorial Hospital, admitted May 13, 1920, male, aged thirty-three years. Operation: cystotomy, a flat ulcerating bladder tumor 2.5 by 2.5 cm. on right lateral wall; fifteen bare tubes of radon .3 mc. each (584 mc. hr.) implanted in tumor. On October 21, 1920, one bladder tube of radon 189 2/13 hr. (129 mc. hr.) applied through cystoscope to recurrence. On January 10, 1921, one bladder tube of radon 194 hr. (130 mc. hr.) applied through cystoscope to recurrence. Pathological examination: solid carcinoma. Carcinoma Registry: squamous cell epidermoid and adenocarcinoma Grade III (Broders himself diagnosed this). In 1932 the patient is well by several cystoscopies.

Case XI. G. H. S., Memorial Hospital, admitted August 5, 1920, male, aged fifty-three years. Cystoscopy showed a slightly sloughy bladder tumor on left base near ureter; two bladder tubes of radon 47 and 44 mc. for 7 hr. (637 mc. hr.) applied to tumor through cystoscope. Pathological examination: suspicious of carcinoma. In May, 1922, cystoscopy showed no tumor. In March, 1923, the patient reported well. No further report.

[1] This seems an incorrect report because of the time, nine years. There was no autospy. Probably she died of same bladder and kidney infection.

Case XII. P. W., Memorial Hospital, admitted November 20, 1921, male, aged fifty-five years. Operation: cystotomy, flat indurated bladder tumor 5 by 5 cm. back of right ureter; fifty-one bare tubes of radon 17.36 mc. (2291 mc. hr.) and two bladder tubes of radon applied to tumor. On May 22, 1923, four bare tubes of radon 3.63 mc. (479 mc. hr.) applied to tumor through cystoscope. Pathological examination: papillary carcinoma. In April, 1927, phosphates removed, no tumor. Patient died in October, 1927, from bladder and kidney infection.

Case XIII. A. V., Memorial Hospital, admitted April 30, 1921, male, aged forty-five years. Cystoscopy showed a solid, partly sloughy bladder tumor 3 by 2.5 cm. on left lateral wall and above left ureter; bladder tubes of radon 300 mc. unscreened (100 mc. hr.) applied to tumor; this was twice repeated. In 1932 slight recurrence treated by radium. Carcinoma Registry: October 24, 1932, papillary carcinoma Grade II, radioresistant. In 1933 the patient had a normal bladder on cystoscopy.

Case XIV. J. B., Memorial Hospital, admitted February 4, 1922, female, aged sixty-three years. Cystoscopy showed an extensive papillary bladder tumor with a base 4 by 4 cm. back of right ureter and over trigone two bladder tubes of radon 110 mc. (550 mc. hr.) applied cystoscopically to tumor, and on nine subsequent times radium was implanted cystoscopically or held against the tumor, the last treatment being given December 30, 1922. Pathological examination: simple papilloma. Carcinoma Registry: papillary carcinoma, Grade II Broders (Ewing 1) arrangement too atypical for simple papilloma. On March 25, 1927, the patient had a normal bladder on cystoscopy. In March, 1933, the patient is partly paralyzed, arterial disease.

Case XV. J. B. H., Memorial Hospital, admitted March 11, 1922, female, aged fifty-three years. Cystoscopy showed a sloughy bladder tumor 3 by 3 cm. on left wall near left ureter. On March 21, 1922, five bare tubes of radon 5 mc. (660 mc. hr.) implanted in tumor and on April 18, 1922, four bare tubes of radon 4.32 mc. (569 mc. hr.) implanted in tumor. Pathological examination: papillary carcinoma. Carcinoma Registry: squamous cell carcinoma, Grade III. In February, 1933, the patient is well and tumor free on cystoscopy.

Case XVI. L. B., Memorial Hospital, admitted May 6, 1922, female, aged forty-five years. Cystoscopy showed a papillary sloughy bladder tumor 2 by 2 cm. on left base. Cystoscopic applications of bare tubes of radon eleven different times. Pathological examination: infiltrating carcinoma. Carcinoma Registry: papillary squamous carcinoma, Grade III (tissue not satisfactory for accurate grading). On November 23, 1926, the patient was tumor free on cystoscopy. On April 7, 1931, a large mass appeared in epigastrium. This was thought to be metastasis from bladder. After death a punch biopsy of the mass was reported (Stewart): cannot make positive diagnosis, suggests adenocarcinoma (bile ducts) rather than bladder cancer.

Case XVII. C. McC., Memorial Hospital, admitted August 22, 1922, male, aged sixty-three years. Cystoscopy showed three papillary bladder tumors, one 3 by 3 cm., one 2 by 1 cm. over base, and one 4 by 4 cm. in urethral orifice. These were treated through the cystoscope with bare tubes of radon. On October 5, 1922, a cystotomy was done and forty-one bare tubes of radon 23.8 mc. (3141 mc. hr.) implanted in tumor. On May 1, 1923, recurrence implanted with bare tubes of radon through cystoscope. Pathological examination: papilloma with cell changes and a tendency to infiltrate. Carcinoma Registry: October 21, 1932, papillary carcinoma, Grade II, radioresistant. On February 27, 1931, the patient died as the result of a bladder infection, bad heart, and uremia. He had suprapubic drainage off and on until death. The bladder showed no tumor on cystoscopy.

Case XVIII. J. W. McT., Memorial Hospital, No. 33036, admitted January 1, 1923, male, aged sixty-four years. Cystoscopy showed a large sloughy tumor 2.5 by 2.5 cm. on left bladder neck. Six seeds of radon 1.06 mc. each (839 mc. hr.) implanted in tumor. On May 8, 1923, three seeds of radon 2.49 mc. each (330 mc. hr.) implanted in tumor through cystoscope. Pathological examination: papilloma. Carcinoma Registry: papillary carcinoma Grade II (Broders), cells degenerated, radioresistant October 21, 1930. On January 2, 1933, the patient is tumor free on cystoscopy.

Case XIX. A. B., Memorial Hospital, admitted May 6, 1924, male, aged fifty-one years. Operation: cystotomy, spinal anes-

thesia, bladder tumor papillary 4 by 3 cm. near right ureter, seven bare tubes of radon .53 mc. (488 mc. hr.) and three bladder tubes 131 mc. for 7 hr. (917 mc. hr.) applied to tumor. On June 4, 1926, three gold tubes of radon 1.76 mc. (696.9 mc. hr.) applied to recurrence. Pathological examination: papilloma, cells atypical but orderly. On January 6, 1933, the patient has a normal bladder on cystoscopy.

Case xx. Dr. M. C. S., Memorial Hospital, admitted February 24, 1925, female, aged fifty-six years. Cystoscopy, flat bladder tumor 2 by 2 cm. on left margin of trigone. Five gold seeds of radon 5 mc. (660 mc. hr.) implanted in tumor through cystoscope. On June 9, 1925, five gold seeds 75 mc. each (643 mc. hr.) implanted in tumor. On June 22, 1926, 266 mc. unscreened radon applied to tumor for 20 min. Pathological examination: infiltrating carcinoma. On November 1, 1932, the patient is well and tumor free.

Case xxi. J. H., Memorial Hospital, admitted June 2, 1925, female, aged sixty-six years. Cystoscopy: bladder tumor papillary 3 by 2 cm. back of left ureter. Five bare tubes of radon 3.15 mc. (415.80 mc. hr.) applied to tumor. On June 14, 1925, seven bare tubes of radon 3.91 mc. (526.68 mc. hr.) applied to tumor through cystoscope. Pathological examination: papillary carcinoma. Carcinoma Registry: December 1, 1930, squamous cell papillary carcinoma, Grade II. On May 12, 1931, the patient was free from tumor on cystoscopy. Died in February, 1932, suddenly from arterial disease.

Case xxii. D. S., Memorial Hospital, admitted October 13, 1925, male, sixty years. Operation: cystotomy, spinal anesthesia. Three papillary bladder tumors on base and lateral walls 4 by 4 cm., 6 by 8 cm. and 4 by 4 cm., 80 sq. cm. indurated. Sixteen gold radon seeds 40.83 mc. (5389.56 mc. hr.) were implanted in tumors. On several subsequent times tubes of screened radon were applied to the tumors. Pathological examination: papilloma, cells somewhat atypical. Carcinoma Registry: October 11, 1931, papillary squamous carcinoma, Grade I. On January 31, 1933, the patient was in excellent health.

Case xxiii. J. B. K., Memorial Hospital, No. 35759, admitted February 12, 1926, male, aged sixty years. Operation: cystotomy, spinal anesthesia, bladder tumor 2 by 1 cm. on trigone and internal urethra. Seven gold radon seeds 2 mc. each (1848 mc. hr.) implanted in tumor, also two bladder tubes of radon 36 and 42 mc. for 4½ hr. (351 mc. hr.) applied in bladder base. Pathological examination: papilloma. Carcinoma Registry: papillary squamous carcinoma, Grade I. On May 12, 1931, recurrence at top of bladder, radium applied through cystoscope and fulgurated. Also on several later occasions. In March, 1932, the patient was tumor free on cystoscopy. On August 26, 1932, the patient died suddenly of a heart attack.

Case xxiv. Z. T., Memorial Hospital, admitted May 22, 1926, male, aged fifty-three years. Operation: cystotomy, a papillary bladder tumor 3 by 2 cm. on right trigone and smaller growths. Eight gold radon seeds 12.80 mc. (1689 mc. hr.) implanted in tumor. On July 30, 1926, two bladder tubes 89 mc. for 7 hr. (613 mc. hr. applied to tumor. On December 12, 1926, one gold radon seed 2 mc. (264 mc. hr.) applied through cystoscope to slight recurrence superficially to tumor. Pathological examination: epithelial papilloma, cells atypical. Carcinoma Registry: papillary squamous carcinoma, Grade II. On April 5, 1929, cystoscopy showed bladder calculus, no tumor. On June 16, 1929, the patient died from infection of the genitourinary tract.

Case xxv. B. S., Memorial Hospital, No. 37384, admitted May 17, 1927, male, aged fifty-two years. On March 9, 1927, cystotomy and cautery at another hospital for a large bladder tumor. Cystoscopy on May 24, 1927, spinal anesthesia. Eight gold radon seeds 16.64 mc. (2916 mc. hr.) implanted in tumor. On July 1, 1927, five gold radon seeds 14.30 mc. (1887 mc. hr.) implanted through cystoscope. Patient also had many courses of deep *x*-ray. Pathological examination: epithelial papilloma. Carcinoma Registry: papillary squamous cell carcinoma, Grade I. On May 19, 1933, the suprapubic sinus still leaking; the patient is in fair condition.

Case xxvi. M. T. B., Memorial Hospital, No. 36445, admitted April 19, 1928, female, aged seventy years. Cystoscopy, spinal anesthesia, papillary bladder tumor 2 by 1 cm. on right wall. Two gold radon seeds 5 mc. (660 mc. hr.) implanted in tumor. On August 21, 1928, 250 mc. of unscreened radon held against the tumor for one hour through the cystoscope under spinal anesthesia. On October 22, 1929, cystoscopy showed two bladder

tumors, one small and one larger; five gold radon seeds, 11.70 mc. (1544 mc. hr.) implanted in the tumors. On December 4, 1929, 298 mc. of unscreened radon held against the tumor for one hour through the cystoscope under spinal anesthesia. Pathological examination: papillary carcinoma, cells very atypical. Carcinoma Registry: October 20, 1932, papillary carcinoma, Grade II, radioresistant. On November 7, 1931, the patient had a clean bladder on cystoscopy and in April, 1933, the patient is well.

Case xxvii. A. C., Memorial Hospital, No. 37341, admitted May 8, 1928, female, aged forty-three years. The patient has had an advanced carcinoma of the cervix treated by radium. Operation: cystotomy, spinal anesthesia, bladder tumor 4 by 4 cm. on base posterior to trigone; 5 gold radon seeds 9.20 mc. (1214 mc. hr.) were implanted in tumor. Also treated with external radiation. Pathological examination: infiltrating carcinoma, bladder, superficial. On June 10, 1932, the patient had a normal bladder on cystoscopy; on February 1, 1933, specimen taken from the bladder, no tumor.

Case xxviii. A. P., Memorial Hospital, No. 34185, admitted September 27, 1928, female, aged forty-six years. Patient was in the Gynecological Service with advanced primary carcinoma of the cervix. Cystoscopy, spinal anesthesia, showed bladder tumor papillary and indurated 2 cm. on base posterior to the trigone. On July 7, 1928, five gold radon seeds 10 mc. (1320 mc. hr.) implanted in tumor cystoscopically. On August 14, 1928, three gold radon seeds 7.5 mc. (990 mc. hr.) implanted cystoscopically. Pathological examination: infiltrating squamous carcinoma. On January 27, 1933, the patient has a normal bladder on cystoscopy.

Case xxix. E. S., Memorial Hospital, No. 39718, admitted February 19, 1929, female, aged fifty-six years. Operation: cystotomy, spinal anesthesia, papillary bladder tumor 3 by 2 cm. on left lateral wall. Fourteen gold radon seeds 8 mc. (4096 mc. hr.) implanted in the tumor. Pathological examination: papilloma with very suspicious carcinoma changes. Recurrence on January 28, 1930, under spinal anesthesia. Four gold radon seeds 8 mc. (1056 mc. hr.) implanted in the tumor through cystoscope. In March, 1933, the patient had no tumor on cystoscopy.

Case xxx. A. M. H., Memorial Hospital, No. 44385, admitted February 9, 1932, female, aged fifty years. Operation: cystotomy, spinal anesthesia, extensive bladder tumor 6 by 8 cm. on base and around bladder neck extending nearly up to either ureter and a small tumor at the apex of the bladder. Fifty-one gold seeds of radon 76 mc. (10108 mc. hr.) implanted into the tumors. Pathological examination: vascular papillary epidermoid carcinoma, Grade 1, radioresistant. Carcinoma Registry: October 20, 1932, papillary carcinoma, Grade II, Broders (Ewing 1). February 16, 1933, the patient had a normal bladder on cystoscopy.

Case xxxi. L. G., Memorial Hospital, admitted July 8, 1932, female, aged fifty-six years. Cystoscopy, spinal anesthesia, several sessile solid bladder tumors on the vault, one was 1.5 cm. in diameter. Twenty-three gold radon seeds 41.53 mc. (5481 mc. hr.) implanted into the tumors on 7 cystoscopies. Pathological examination: squamous carcinoma, Grade II, radioresistant. On March 10, 1933, the patient had a normal bladder on cystoscopy.

Case xxxii. A. A. K., Memorial Hospital, No. 45651, admitted November 8, 1932, male, aged fifty-two years. Cystoscopy, spinal anesthesia, solid papillary bladder tumor 1 cm. sq. on right base over left ureter. Four gold seeds 7.80 mc. (1182 mc. hr.) implanted in tumor. Pathological examination: papillary epidermoid carcinoma, Grade II, radioresistant. On March 2, 1933, the patient had a normal bladder on cystoscopy.

Case xxxiii. E. D., Memorial Hospital, admitted December 27, 1932, female, aged seventy-five years. Cystoscopy, sessile sloughy bladder tumor 4 cm. in diameter in vault of bladder. Six gold radon seeds 10.60 mc. (1409.80 mc. hr.) implanted into the tumor through the cystoscope. Pathological examination: epidermoid carcinoma, Grade II, radioresistant. On February 28, 1933, the patient had no tumor on cystoscopy.

Case xxxiv. M. E. D., Memorial Hospital, No. 48183, admitted May 5, 1934, aged sixty years. Hematuria for one year. Cystoscopy, back of right ureter on ureteral ridge is a pedunculated pink hard tumor. Specimen, papillary epidermoid carcinoma, Grade 1 (M.H.). Radon seeds implanted three times and finally unscreened radium held against the tumor. On January 5, 1935, slight flat slough, no tumor.

Case xxxv. W. A. G., admitted to the Memorial Hospital on July 17, 1934, aged sixty-five years. Hematuria eight months ago. Cystoscopy, on left side of bladder wall just back of left ureter a 2 × 3 cm. pink papillary tumor. Pathology, atypical papilloma (papillary carcinoma). Implanted three times with radon seeds. On January 8, 1935 flat small slough at site of tumor, no tumor.

Case xxxvi. S. C., Memorial Hospital, No. 47794, admitted February 23, 1934, aged sixty-five years. Cystoscopy, just back and touching right ureter is a pink, papillary tumor 1 × 2 cm. Pathology, epidermoid carcinoma Grade iii (M. H.), Grade iv (Broders). Implanted twice with radon seeds. On September 18, 1934 tumor gone, normal mucous membrane. In November 1934, slight papilloma of urethral orifice, not related to original tumor, fulgurated. In December 1934, tumor all gone.

SUMMARY

Thirty-six patients having carcinoma of the bladder have been controlled between periods of one and twenty years by the cystoscopic application of radon. Twenty-seven were treated by cystoscopic application alone and seven were recurrences of the carcinoma after the suprapubic application of radon and two were secondary to cervical carcinoma. We have controlled 27 papillary and 7 infiltrating carcinomas. There is no mortality to the procedure and if these seeds are properly placed there is no danger of penetrating the bladder with the radon-bearing needle.

CANCER OF THE PENIS: SURGICAL TREATMENT*

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THE size and depth of invasion of the growth, and metastasis determine the treatment in cancer of the penis. A dorsal slit of the prepuce may be required properly to examine the tumor and to facilitate treatment. Cancer of the penis falls into four main clinical groups:

(1) Superficial growths less than 2 cm. in diameter and without palpable metastases.

(2) Superficial growths apparently with metastases (the inguinal lymphadenopathy is commonly inflammatory only).

(3) Locally penetrating growths: even though not distinctly palpable, metastases may be assumed to exist in half of these cases.

(4) Hopelessly advanced growths with metastasis.

In the present discussion we are chiefly concerned with groups (2) and (3). Superficial growths less than 2 cm. in diameter and without metastasis (group 1) will regularly be cured by radiation therapy.† Hopelessly advanced lesions (group 4) should not be operated upon. Experience at the Memorial Hospital in New York has shown that in penile cancer preoperative and postoperative irradiation is without benefit.[1]

SURGICAL ANATOMY

The lymphatics of the penis form (1) a superficial and (2) a deep chain.

(1) The superficial vessels drain the prepuce and skin and unite in a dorsal lymph cord which passes to the base of the organ where the vessels divide to pass on each side to the superficial inguinal nodes. Branches from the dorsal penile lymphatics pass also to the small prepubic nodes at the base of the organ and some vessels are believed to drain into the deep femoral nodes.

(2) The deep lymphatics drain the glans, cavernous bodies and urethra. At the base of the penis these vessels pass to: (1) the deep inguinal nodes, (2) nodes beneath the spermatic cord within the inguinal canal, (3) the external iliac nodes, and (4) the deep femoral glands. Subpubic drainage along the dorsal veins to the hypogastric nodes may also occur.

SURGICAL INDICATIONS

If the growth remains superficial to Buck's fascia, only the superficial lymphatics are likely to be involved and if regional nodes are invaded, generally they are only the superficial inguinal. If the cancer penetrates the cavernous bodies, it spreads by embolism through the lymphatics to the regional nodes, and by direct extension to the base of the penis and sometimes even to the crural attachments. Fortunately in these cases the rate of growth and extension of the tumor is usually slow. Therefore, in mild local cancerous invasion of the cavernous bodies, penile amputation an inch behind the growth is frequently curative. As a rule, however, in growths involving the corpora cavernosa, extensive penile amputation

† The dose used at the Memorial Hospital is 1200 mc.hr. at 1 cm. distance filtered through 0.5 mm. of silver and 1 mm. of brass.[1] This is applied over the primary tumor in the form of a radon plaque.

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(extirpation) (Fig. 3) is required, including frequently removal of the regional lymph nodes. Yet in 50 per cent of the cases with palpable inguinal lymph glands, the adenopathy is inflammatory rather than neoplastic[1] and following removal of the infected tumor of the penis, the lymphadenitis disappears. In the absence of metastasis the inflamed glands are later identified only by nodular sclerosis. The writer feels that in most instances only amputation of the penis should be performed at the first attack. But if there is evidence of metastasis after six to eight weeks, during which time the lymphadenitis will disappear, radical resection of the lymphatics of the groin should be performed as the second step. This last procedure is not to be undertaken lightly. It entails a mortality of 20 per cent and since there is an even chance that the inguinal adenopathy is inflammatory rather than neoplastic, the patient should be given the benefit of the doubt. Moreover, some surgeons most experienced in this field believe that once metastasis to the groin occurs, the outlook is practically hopeless. Because of the not infrequent late metastatic recurrence of the disease, the five-year standard of cure can not be seriously applied in cancer of the penis.

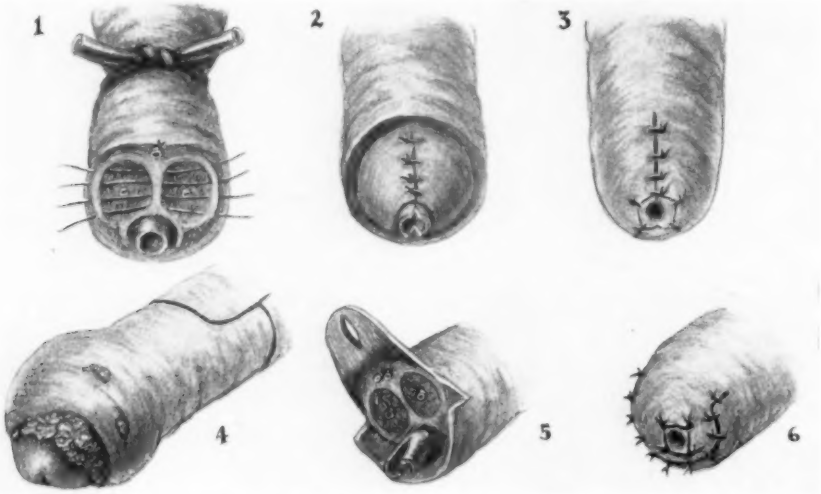

Fig. 1. Conservative amputation of penis without resection of regional lymphatics. 1–3, Circular excision and method of closure. 4–6, Dorsal flap method. Not shown are (1) a small wick drain which should be left in subcutaneous space for a day and (2) an indwelling catheter to help keep wound dry and clean.

Because the urethra is less often and less extensively invaded than are the corpora cavernosa, 1.5 to 2.0 cm. less of the canal than of the remainder of the penis (Fig. 1) need be excised. Because the lymphatics of the testes and scrotum are apart from those of the penis, there is no indication for castration even in advanced carcinoma of the penis. On the other hand, castration has frequently been urged in these cases to reduce the libido. Yet personal observation of several patients on the Urological Service at Bellevue Hospital, emasculated for penile cancer, revealed a despondency in these unfortunates far more grave than an unrequitable sexual urge is likely to engender. Moreover, a partial amputation suffices in most instances and as Young[2] has emphasized the remaining penile stump (Fig. 2) may permit intercourse which is variably satisfactory.

From the foregoing it is evident that no one operation will fit all cases. It is necessary therefore to outline the following procedures:

(1) Partial or conservative amputation without, and (2) with excision of the regional lymphatics, (3) extirpation with resection of the lymphatics. Emasculation merits no description here.

Anesthesia. Spinal anesthesia is my preference for all operations on the cancerous penis. When dissection of the inguinal glands is to be performed, nupercaine rather than novocaine should be used because its action is more prolonged.

(1) *Partial Amputation without Resection of the Regional Lymphatics* (Fig. 1):

Step 1. The patient is placed in the recumbent position. A sound is introduced into the urethra as a guide.

Step 2. A tourniquet is applied to the base of the penis.

Step 3. A circular incision an inch behind the palpable proximal extension of the growth divides the skin and subcutaneous fascia down to the fibrous envelope of the corpora.

Step 4. The skin is now retracted and dissected back until of sufficient length not only to be convertible into an ample covering for the penile stump but to allow for erections.

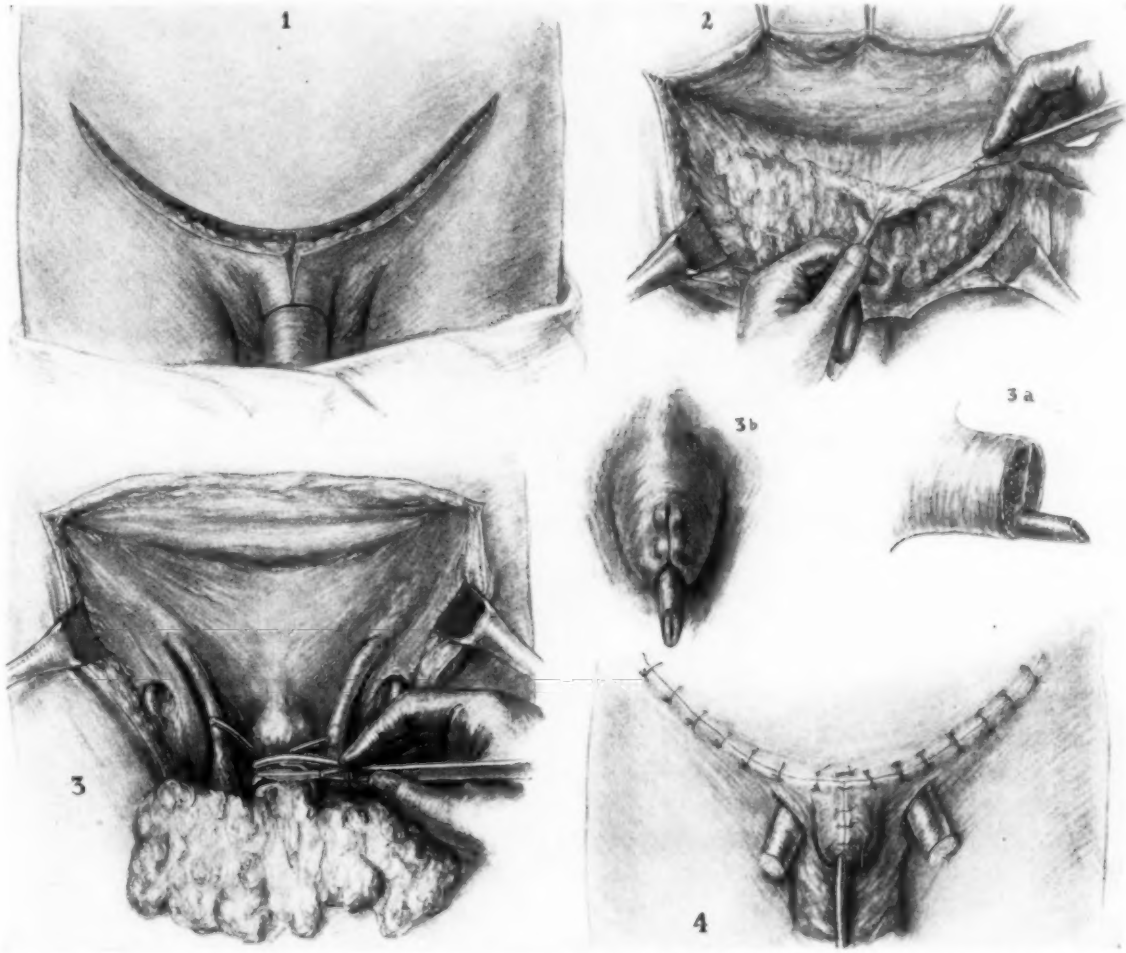

Fig. 2. Radical amputation advocated by Young. Penis is divided down to corpus spongiosum 2.5 to 3 cm. proximal to carcinoma and is removed en bloc with regional lymphatics. A penile stump is preserved (redrawn after Young).

Step 5. Beginning on the dorsum penis just anterior to the line of attachment of the retracted cuff of penile skin, the corpora cavernosa are divided downward as far as the corpus spongiosum and urethra. The latter is dissected forward and after removing the guiding sound is cut off so as to leave a protruding stump 1.5 to 2.0 cm. long.

Step 6. The dorsal arteries and veins and the cavernous arteries are ligated. The cavernous bodies are closed over by suturing their sheaths to each other with

0 chromic gut. The torniquet is now removed and hemostasis is completed.

Step 7. The urethral stump is divided dorsal and a short ventral skin flap are made (Fig. 1, No. 4). The penile body is amputated and the wound of the stump is closed

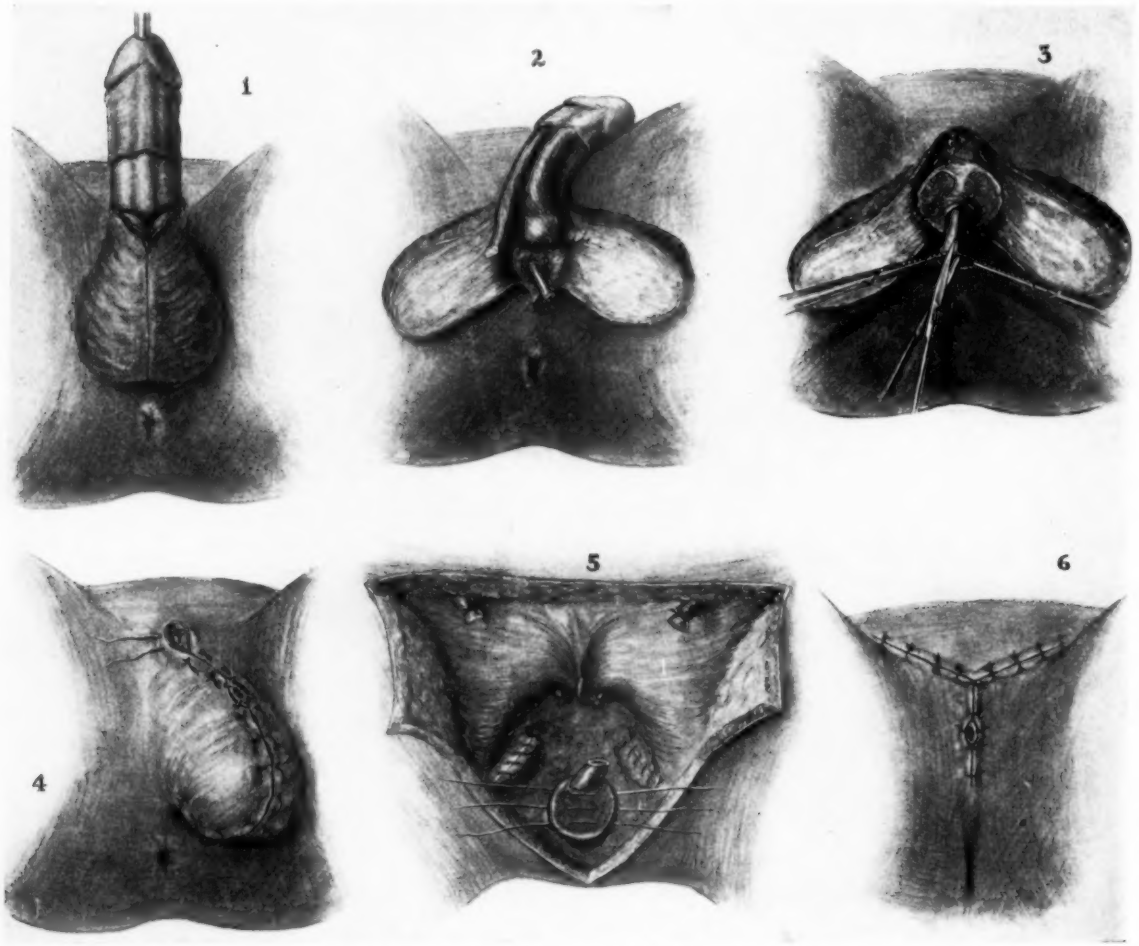

Fig. 3. Extensive removal of penis for carcinoma. (1) Incision. (2) Scrotum split, urethra mobilized (for perineal insertion) and crura penis separated from pubic rami. (3) Base of penis preserved and urethra left sufficiently long for transplantation to upper anterior scrotum as shown in (4). (5) Radical amputation showing spermatic cord and dorsal penile vessels tied off on each side; stumps of resected roots of corpora cavernosa are sewn over and urethra is left short for perineal insertion as shown in (6). When resection of regional lymphatics is an added procedure, exposure is appropriatedly enlarged as suggested in Figure 2, No. 3.

for about 5 mm. on its floor and roof to prevent contracture of the orifice and the two flaps are sewn to the previously prepared cuff of skin with which the penile stump is now closed over (Fig. 1, No. 3). The penile stump should be drained by a small rubber wick.

Step 8. An indwelling urethral catheter facilitates urinary drainage until reasonably firm union of the wound occurs.

The dorsal flap method may be also employed and differs from the previously described operation only in that a long as previously described, the urethra being brought out through an appropriate opening made in the dorsal skin-flap (Fig. 1 Nos. 5, 6).

(2) *Radical Amputation:* In this operation extirpation of the lymphatics which drain the penis is combined with partial penile amputation. Some modification of the operation outlined by Young may be used.

Step 1. The incision is indicated in Figure 2. Beginning in the upper outer angles of the incision in the groins, the surgeon working in one groin and his assistant

operating simultaneously in the other, the inguinal glands and the surrounding fat are dissected out en masse (Fig. 2, No. 3). This bares the deep fascia.

Step 2. The spermatic cords are dissected clean and the excision is carried down to include the fat and lymphatics of the upper inner thigh and upper outer scrotum. Young recommends division of the saphenous and superficial epigastric veins to allow deep dissection of the lymphatics.

Step 3. The cribriform fascia is opened to permit removal of the fat and glands within the femoral ring.

Step 4. The dissection is now carried to the base of the penis and, after the suspensory ligament is divided, is carried forward on the dorsum of the organ.

Step 5. Partial amputation of the penis 2.5 to 3 cm. proximal to the growth (as previously described) is now performed.

Step 6. The skin is closed with ample drainage of the subcutaneous spaces (Fig. 2, No. 4) and with indwelling catheter drainage of the bladder.

(3) *Extirpation of the Penis:* This is indicated in the advanced cases of group 3 (see initial paragraph).

When the growth is extensive enough to indicate extirpation of the penis, the regional lymphatics also should be excised. This has been described in the preceding section. It is performed as the first step in the extirpation operation and with the patient in the recumbent position.

Step 2. For the extirpation, the patient is placed in the perineal lithotomy position and a sound is passed to the deep urethra as a guide.

Step 3. The scrotum is split in the midline; the incision is carried to the midperineum below and encircles the penis above. The base of the penis including the attachments of the corpora cavernosa on each side and the deep bulbous urethra are mobilized.

Step 4. The urethra is dissected from the corpus cavernosa for a distance which is determined by the proposed ultimate disposition of the urinary ejaculation, that is, whether the urethra will open into the midperineum or will be carried forward to open on the anterior upper scrotum. For a perineal opening about 3 cm. of the urethra anterior to the triangular ligament is necessary. For a scrotal opening the urethra is divided just proximal to the penoscrotal junction.

Step 5. Having divided the urethra and corpus spongiosum, the corpora cavernosa are excised by division of their crura at the pubic rami. The large penile vessels are ligated, the crural stumps are sutured over (Fig. 3, No. 5).

Step 6. The opening of the urethra is split for 1 cm. into two flaps to prevent its contracture postoperatively.

Step 7. The perineum and scrotum are closed in the midline.

Step 8. When the urethral stump has been left short it is sutured to the midperineal portion of the wound. These patients must squat to urinate. Preferably the urethral segment is dissected sufficiently long to be brought out to discharge in the upper anterior scrotum. With manipulation of the scrotum, these patients can stand to urinate, a matter of considerable psychic importance.

Step 9. Indwelling catheter drainage is instituted after having provided adequate cigarette drainage of the wounds.

POSTOPERATIVE CARE

Dilatation of the new urethral orifice with sounds is the chief requisite in the proper postoperative treatment; this will prevent stricture, the tendency to which is always evident in all cases of urethral transplantation. Free urinary drainage must be maintained in such a manner as to prevent soiling of the wounds; an indwelling catheter is usually adequate. When the latter is unsuccessful, perineal urethral boutonniere may be employed. The wounds require only the usual surgical care.

COMPLICATIONS

Hemorrhage. Penile bleeding during the operation is controlled largely by torniquet. Rigid hemostasis must precede closure of the wounds. Postoperative hemorrhage is almost always the result of infection and sloughing. Packing and pressure will usually check the bleeding yet ligature may be necessary.

Infection. Proper preoperative isolation of the infected cancerous portion of the penis by a thick tight wrapping with gauze will do most to prevent contamination of the wounds. Anemic necrosis of the skin results when excision of the glands and fat in the groin is carried too close to the surface. The necrosis invites infection; vascular thrombosis secondary to the new infection commonly results in wider skin necrosis. In one such case at Bellevue Hospital, this vicious cycle caused the entire cutaneous covering of the operative area to slough away. Sepsis causes many postoperative deaths. Not infrequently the infection arises in infected lymph glands in the groin. Resection of the glands should not be performed while acute lymphadenitis exists. The latter will usually subside if the tumor is widely exposed (dorsal slit) and is kept clean and dry.

SUMMARY

1. The treatment of carcinoma of the penis is guided by the size of the growth, its depth of invasion and metastases. In other words, intelligent treatment implies a comprehensive appreciation of the surgical anatomy.

2. Superficial growths less than 2 cm. in diameter and without metastasis will regularly be cured by irradiation therapy.

3. Hopelessly advanced carcinoma of the penis should not be operated upon.

4. When there are apparently no metastases, conservative amputation should be performed.

5. When there apparently are metastases in the groin, in half of the cases the suspected lymphadenopathy is purely inflammatory.

6. When metastases are proved to exist, the regional lymphatics should be excised en masse. Operations to accomplish this are described.

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TEACHING OF OBSTETRICS AND GYNECOLOGY IN THE UNITED STATES*

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IN considering the maternal and fetal mortality in the United States, I believe that the chief factor which is responsible for our appalling results is the inadequate teaching of obstetrics and gynecology in most of the medical schools of our country. This subject has been given a place in our universities second in importance to general surgery and medicine, although actually it is probably of greater importance than either of these, as it deals with the health and well-being of those who must supply the citizens of the nation. In Great Britain midwifery and the diseases of women form one-third of all qualifying examinations for the student of medicine. The German and Scandinavian universities similarly accord to obstetrics and gynecology a prominent place in their curricula. In this country we are just awakening. Even among some of our supposedly first class universities, obstetrics and gynecology assumes an inferior role to general surgery.

Comyns Berkeley, in a brilliant lecture on the teaching of obstetrics, stated that public opinion in England has at last been roused because of the fact that the maternal mortality and morbidity in the British Isles had not been lowered for the last twenty years, a statement which cannot be made about any other medical condition or disease. He places most of the blame on the very inadequate teaching of obstetrics. He writes:

> Midwifery and the diseases of women form one-third of all qualifying examinations for the medical student, and it is perhaps the most important of all three parts dealing, as it does, with the well-being of those who supply the nation with citizens. Again, for some reason which its teachers can never understand, midwifery has always been regarded as a specialty in the hospital world and probably also in the minds of the lay public. It is no more a specialty than medicine and surgery, forming as it does one of the Trinity of medicine. The Medical Act draws, and knows, no difference between medicine, surgery and midwifery.

It seems to be forgotten that general practitioners usually do not practice surgery. They consult a surgeon or send the patient to a hospital. However, the general practitioner will and does often deliver women. We must realize that any normal obstetrical patient may become abnormal within a period of minutes, not hours. How then can a general practitioner, not properly taught and trained in obstetrics, assume the care of a pregnancy and delivery with full confidence. Even in general medicine, the physician has usually time to look around, to consult another physician. In obstetrics, emergencies arise so suddenly and may eventuate fatally within such a short period of time that the man or woman who assumes the care, supervision and attendance of maternity patients, must at all times have enough knowledge and training at his command to save, and not endanger, the lives of two individuals, the mother and her child, a double responsibility compared to that of the surgeon or physician.

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It is to me a very interesting commentary on our present-day type of medicine, that no one of us would allow a newly graduated doctor to remove our appendix. We look for some one who has had surgical training in a hospital. Yet we will allow our wives and sisters to be delivered by a young untrained graduate, who, if he was lucky, had attended ten or twelve normal deliveries under the eyes of his professor of obstetrics and gynecology. It is not necessary for me to tell a group of specialists in obstetrics what such a procedure signifies. It would be well, however, if those in whose hands the undergraduate teaching of our medical students is entrusted, would realize their responsibility. I go so far as to say that the blame for the appalling number of maternal and fetal deaths recorded annually in this country should be ascribed, in great part, to the deans and curriculum committees of our medical schools.

The Sub-committee on Undergraduate Teaching of Obstetrics of the White House Conference on Child Health and Protection, found that:

> Instruction in obstetrics to medical students is a desideratum of prime importance in the determination of maternal morbidity and mortality. The better the clinical training of students in the art of obstetrics the better obstetrics they will practice and this, in turn, will be reflected in improved results. Didactic teaching of obstetrics, in the United States, is and has been fairly satisfactory, save that it has been overstressed in many schools for want of clinical material. The need is not for less theory but for more clinical instruction. Our maternal mortality rate exceeds that of any and all continental countries; it exceeds that of Canada and some of the Republics of South America, in short it is the highest of the civilized world. We could go far in correcting this disgraceful state of affairs if our teaching institutions would provide adequate facilities for clinical instruction in obstetrics.

The correction of this shameful state of affairs of lies, in great part, in the medical schools.

I am firmly convinced that better obstetrics can be realized only through two factors, firstly by far more thorough teaching of our specialty in the medical schools, and secondly by better hospital training in obstetrics for the young graduate who will sooner or later be called upon to deliver a woman of her child. I believe that obstetrics and gynecology should be on a par with medicine and surgery in the curricula of our schools. How can this be accomplished? Firstly, by realizing ourselves that this is an absolute essential and secondly by educating and convincing the members in the other branches of medicine that such must be the case if we are to lower the country's maternal and fetal death rates.

Five years ago the catalogue of the Cornell University Medical College assigned 306 compulsory hours to the Department of Obstetrics and Gynecology as compared with 562 for surgery and 678 for medicine.

Today our specialty has 604 compulsory hours allotted to it, compared with 680 for medicine and 630 for general surgery, during the two clinical years of the curriculum. Obstetrics and Gynecology, then, is on a par with general surgery and medicine; and this is as it should be in all medical schools in our country.

Before outlining some details of the present method of teaching undergraduate medical students in this University, I should like to point out that obstetrics and gynecology must be intimately bound together in one department if our results are to improve. No one practicing obstetrics, without a first-hand appreciation of pelvic surgery or gynecology, can do full justice to his patient, and this applies equally well to the gynecologist untrained in obstetrics. The White House Conference Committee, after exhaustive study, recommended:

> Unification of the departments of obstetrics and gynecology in medical schools and in all hospitals affiliated with and controlled by the university.

All members of the teaching staff should be qualified obstetricians and gynecologists.

and further that:

The European plan of the "Frauenklinik" which has been initiated in this country should be extended to all medical schools. Gynecology should be confined to a place subordinate to obstetrics.

Fortunately many of our schools today have a combined department of obstetrics and gynecology. However, there are still some, and among these a few of the larger universities, where private interest or lack of a broad and comprehensive vision in medicine, keeps the two apart, and subjugates gynecology, and even obstetrics, to such general departments as surgery. This is most unfortunate and forms one of the major obstacles in this country to medical progress.

It is often claimed that anyone who operates on the abdomen should be able to cope with any pathology he may meet, whether in the pelvis or upper abdomen. This would imply, it seems to me, that the general surgeon should also be an urologist. Even if the gynecologist be not trained in intestinal surgery, or gall-bladder surgery, our diagnosis of today, if of the first order, makes it very improbable that he will be called upon to perform a gastroenterostomy. Furthermore, even if his diagnosis were wrong he is always at liberty and has the opportunity to call in a general surgeon. Experience is our best teacher and we should heed its teachings. Such theoretical arguments fall to the ground in the face of actual experience. It may be interesting to note that in some places where gynecology is a branch of general surgery, the gynecologist seldom does intestinal or gall-bladder surgery and so cannot possibly keep himself in training for such emergencies. It should further be noted that the published annual reports of most of the combined departments of obstetrics and gynecology are certainly not worse, and often far better than those from the separate departments.

A further argument against the combination in practice has been that it is impracticable for a man to be up all night with a labor case and then operate in the morning. All doctors, specializing as obstetricians and gynecologists, have connections with hospitals, most of them first-class, thanks to the efforts of the American College of Surgeons and the American Medical Association. Good hospitals with trained resident staffs are decreasing the necessity of all night vigil with every patient in labor. In the many hospitals where men are practicing both obstetrics and gynecology we find that the foregoing argument similarly falls to the ground.

Regarding this particular argument, the recommendations of the White House Conference committee are instructive. The committee states that it finds difficulty to assent to the criticism, voiced fortunately by only three deans out of 40 questioned, that the exactions of an obstetric practice would unfit one for operative work. From the answers received from the heads of departments in 40 medical schools it is clear that there is fortunately still only a small and ever dwindling number of teachers in this country who believe that the two departments should be separate. The White House Committee's conclusions state in no uncertain terms that the two subjects, obstetrics and gynecology, are so intimately related as to be inseparable and that the head of the combined department should have a practical, as well as theoretical, knowledge of both. If this last requirement were met by each obstetrician or gynecologist who practices and teaches in our country, we would not hear of the foregoing unfounded arguments, on the part of those attempting to maintain separate departments, or make gynceology part of general surgery, where the gynecologist even operates on male patients.

Having disposed of these fallacious arguments let us now consider why obstetrics and gynecology should be under one department. Both deal with female

physiology, with the reproductive system of woman. This, in itself, is a big subject. It seems to me that the general surgeon has enough other problems to profitably engage his mind if he is to be a good surgeon, and must be most unusual if he can in addition be a scholar of female physiology, and all obstetricians and gynecologists worthy of the name should be fully acquainted with all phases of female physiology.

Secondly, operative obstetrics to be done well should be done by one familiar with and trained in operative methods and asepsis. The obstetrician whose only surgical work consists in the occasional cesarean section cannot do good surgery, and should not do that section. Similarly the gynecologist, if he is to be somewhat more than a knife-loving operator, must have an obstetrical point of view. This he cannot have unless he be trained in the combined subject.

All progress in medicine depends upon careful observation and investigative work. Obstetrics and gynecology are in a field with common interests and its investigative work should be conducted in a combined department. We are just on the threshold of discoveries in such fundamental questions as the hormones related to menstruation and reproduction. How can one, not schooled in all the phases of female physiology, hope to comprehend, much less add to, the information of the intricate relationships of these hormones?

Finally I should like to point out that the therapeutics of both obstetrics and gynecology are predominantly conservative. Gynecology is not primarily operating, and has no place for one imbued with a "*furor operandi.*" Gynecology deals with the female reproductive system in all its phases, being bound irrevocably with the act of reproduction, the medical care of which we have come to call obstetrics. This is so and will remain thus notwithstanding those who, due either to their training and environment or to misinformation and prejudice retard the wheels of medical progress by attempting to keep them apart. Let us follow the lead of the older countries, such as Germany and others, let us learn from experience gained within our own borders and let us use our influence to bring about combined departments of obstetrics and gynecology in our medical schools, and true woman's clinics or "Frauenkliniken" in our university hospitals.

As the curriculum of the Cornell University Medical School embodies our ideas regarding undergraduate teaching, the following is a brief outline of the course in obstetrics and gynecology. The student is introduced to the subject during his third year and is given an introductory didactic course consisting of about fifty lectures. In addition he receives practical instruction in palpation, pelvic examinations, mannikin, obstetrical and gynecological pathology, obstetrical and gynecological bacteriology and isolation technique, dispensary clinics, demonstrations and ward rounds. During his fourth year he lives two months in the department of obstetrics and gynecology. This course comprises practical work in obstetrics and gynecology and is the sequel to the theoretical instruction offered to the third year students. Each student lives in the Woman's Clinic for a period of two months, during which time he acts as a clinical assistant in the obstetrical and gynecological out-patient department, hospital wards and delivery and operating rooms. He is provided with sleeping accommodations, but not with board.

The practical work includes the prenatal care of many patients, attending them in labor, their delivery, as well as following them throughout the course of the puerperium. Facilities are also provided for the student to examine gynecological patients, and to follow these patients through diagnostic and therapeutic procedures.

Two months' residence throughout one quarter, and because of the nature of the service, night and holiday work are required.

Each student delivers from 30 to 50 patients during his two months' residence in the hospital, and assists in from 50 to 65 deliveries.

In addition to undergraduate teaching a one-month *postgraduate course* has been offered to physicians seriously interested in obstetrics and gynecology. This course comprises regular rounds on the delivery floor and the wards of the hospital, instruction in the operating room, attendance in the antenatal, postpartum, gynecological, cystoscopic, sterility, endocrine and cancer out-patient clinics, as well as staff conferences and lecturers. Each man is on delivery floor call on alternate nights. The course is essentially one of instruction in the various phases of the work of the Lying-In Hospital but does not include actual performances of operations or deliveries. No diploma or certificate is granted, but the course is constantly supervised and at its beginning and termination each candidate is personally interviewed by the Professor of Obstetrics and Gynecology.

We have at present temporarily discontinued this course because of the time necessarily devoted to such a course by the staff in a department with many varied teaching activities.

Postgraduate courses in obstetrics and gynecology have not been greatly developed in this country. A very small percentage of medical schools offer such courses. It is urgent that wherever the teaching personnel and clinical material are available, such courses be offered to those desiring to improve their knowledge and skill in this field.

An all important phase of the teaching of obstetrics and gynecology is the manner in which we train graduates who desire to make this subject their specialty. This means the type of hospital training offered to such individuals. I am a strong believer in the resident system for those who wish to become specialists. A few months' training is worse than inadequate, it is dangerous. The proper training should entail years, four or five, of actual hospital work. You and others may say that young graduates cannot afford such long training, in which event you will be surprised to learn that each year we have ten or more times the applications we need. The young man going into obstetrics and gynecology today usually wants long and good training. Often he cannot get these.

At the Woman's Clinic of the New York Hospital we have installed a five-year residency system in obstetrics and gynecology. The first year the young interne spends all his time in obstetrics, while the second year is devoted to gynecology and a small amount of obstetrics. His third year he becomes an assistant resident, assuming duties with greater responsibility. He now supervises an outdoor delivery service for three months, having three internes under him, has charge of the registrations and house staff of the out-patient or dispensary for three months, has charge of obstetrical wards for three months, and spends three months on the gynecological wards and operating rooms. His fourth year he is a first assistant resident, spending six months in obstetrics, where he sees, supervises and does a great deal of abnormal obstetrics and six months on the gynecological wards and operating rooms. He also spends a great deal of time in the sub-department of gynecological pathology, having had an introduction to this work during his third year of training. His fifth year he becomes the resident obstetrician and gynecologist.

I consider the above the ideal system of training men in our field as specialists. The only drawback is that all cannot go through to the residency. This is inevitable. Nevertheless, even those, and there are six each year, who obtain only one year of training, have acquired a fundamental training in obstetrics and have seen and heard a great deal of gynecology. They certainly are excellently equipped to practice medicine as general practitioners and competent to care for uncomplicated maternity cases.

I should like to make a plea here for longer rotating interneships in our hospitals. I am not a great believer in rotating interneships as offered by most institutions. To my mind a one year rotating interneship is almost a waste of time. The interne has not enough time to become trained in any one of the branches of medicine. Such rotating interneships should be not less than twenty-four months, giving for example, six to eight months to obstetrics and gynecology.

Experience in a number of States has shown that circuit or extension courses are of great value to the physicians in small and rural communities. These courses are of definite value and offer us a further means of elevating the standard of obstetrics throughout the land. Each state in the Union through its proper agencies, should foster and sponsor such education.

In this short paper I have attempted to show the importance of adequate teaching and training in obstetrics and gynecology. I have expressed the opinion that our appalling maternal mortality figures may in great part be ascribed to the inferior place accorded obstetrics and gynecology in the curricula of our medical schools. I have shown the fallacy in the arguments of those who attempt to keep obstetrics and gynecology apart, and have given the sound reasons why these branches should form a combined department in every medical school and every hospital affiliated with a university in this country. I have outlined what I consider adequate undergraduate teaching in this field, as well as an ideal hospital training for those who wish to practice obstetrics and gynecology. Stress has also been placed upon the value of post-graduate and circuit courses in elevating the standards of obstetrics and gynecology in this land.

The medical profession can and should do a great deal to help elevate obstetrics and gynecology to the important place, where it rightfully belongs. It should use its influence to the fullest in order to effect the necessary changes, already outlined, in the curricula of our medical schools and in the methods of interne and resident training in our hospitals.

ORGANIC CONTROL OF GROWTH AND NEW GROWTH*

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THE years have brought changing concepts as to the relation of the individual to his elements. The activities and importance of individual cells are constantly being stressed; but the uselessness of such cells without community organization and direction is as often overlooked. The embryonic myocardial cells that for years have proliferated under glass in the Rockefeller Institute express how formless and how useless cell growth may be without organic control.

A third of a century ago we believed that cells and tissues, or indeed parts or organs of the body were more or less independent of the individual and could be transplanted to serve the recipient as they had served the donor. Grafts even of frog skin and of the lining of eggs were approved, and as skin grafts were applied to denuded surfaces. Organs such as the thyroid, ovary, testicle, were taken from one body to be planted in another. Alexis Carrel with his meticulous technique reported apparent successful transplantations of the kidney and of members of living animals. Abbe presented experiments that favored the grafting of a hand or leg from one person to another; and in certain hospitals dogs were fastened to the bodies of men in order that living canine bone might replace that of the human. I even visioned the day when mental defectives would supply organs and members to those with brains able to use them. The folly of all this is now apparent. Heterologous grafting which the botanist so readily carries out with his lower forms of life is not possible in the higher animal. The human body permits no alien cell to serve in its structure. It rigidly controls the life and growth of its component parts. Even the simple epithelial cells of the mother are not transplantable to the child. True, they may multiply on a suitably prepared surface for a week or so, but only until the child's body marshals its forces to destroy them. Repeat the skin grafting and the alien cells are destroyed more rapidly than before. As far as we know, homologous skin grafting is only possible, as recently has been shown, between homologous twins. Yet how much useless grafting of skin and other tissue from one person to another is still attempted. Within limitations, the body permits the transfer of skin and parts from one portion of its anatomy to another, but note that the transplanted tissue remains under absolute growth control. Transplanted epithelium does not become exuberant. The new nose made from cartilage and the skin of the forehead does not hypertrophy. The toe transplanted to replace a lost finger does not acquire giant size. It has been estimated that cells from an embryonic chick growing in the laboratory would, in the span of a man's life, if nourished and not destroyed, fill and cover the laboratory building and attain the weight of many tons, yet the adult fowl never exceeds a few pounds in weight. What holds the kidney and other organs to rigid specification as to size and shape? Why is it that the liver of a dog from which Mann by successive resections has removed a quantity equalling or exceeding the total weight of the organ, regenerates only to the approximate size and shape of the particular liver, but not beyond this? Years ago this was largely answered by the finding of two

* From the Surgical Department, Temple University, Philadelphia. Presidential address, Forty-seventh Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Sept. 7, 1934.

specific substances in the blood for each organ: one lytic (hepatolysin for the liver) or cell destructive; the other anabolic or stimulating the multiplication of the special cells. By a nicety of balance between these two the part acquires proper size and shape. From such a chemical control of growth we may evolve a hypothesis as to the origin of tumors. Instead of repeated traumatism or continued irritation directly causing an epithelioma, we may assume that the long-continued stimulus to epithelial repair in the area finally exhausts or overwhelms the restraining lytic inhibition to new growth, and as a result an invasive overgrowth occurs. The continued suppression no longer effective, catabolic activity and the normal tendency toward cell proliferation is set free. It would seem that the body develops in a chemical mold; each part growing to specified dimensions under control of substances circulating in the blood that stimulate or check the proliferation of cells. It is my impression that up to the time the ductless glands of the fetus have sufficiently developed to take over the function, the maternal blood is the architect for the embryo, arranging the genes after the pattern of the host. These chemical influences are so powerful that it may be necessary to discard some of our rigid concepts as to maternal impressions. What proof have we that a part of the embryo cannot be altered by maternal hormones after it has been laid down in the uterus? In the adult woman each month hormones tear down ducts and acini in breast and cells and glands of the endometrium. Our as yet scanty knowledge has already revealed an overwhelming influence of the hormones of pregnancy upon the development of the child that may even continue after birth. Consider for example the hypertrophic secretion of milk in the breasts of newborn boy babies from an excess of the pregnancy hormone, or the rapid and premature descent of the testes and hyperplasia of the external genitals in monkeys produced by Engle by injecting substances derived from the urine of pregnant women. Cohn very recently by injecting the anterior pituitary like substance obtained from the urine of pregnancy reports an amazingly rapid movement of undescended testicles in infants. Studies of the female sex hormones, for which we owe so much to the obstetrician, offer much more than an explanation for estrus, or a test for pregnancy or for certain tumors. It is my impression that investigations in this phase of organic control may reveal the long-sought key to the nature of cancer and other new growths. For years we have defined tumors as new growths without the organo-genetic influence. Attention is still being focused upon the cancer cell as the prime factor in malignant disease, yet one neoplasm after another has been found to arise not from the cell but from modifications in cell control. Endometriomas, for example, have all the characteristics of carcinoma. They invade and destroy tissue, produce apparent metastases and recur after removal; yet they atrophy and disappear when the hormonal influence from the ovaries is withdrawn. Formerly they were considered to be cancers. Now we must consider them as destructive cell hyperplasias, the result of a female sex hormone. In the past many limbs were amputated for a so-called myeloma or giant cell sarcoma. This tumor destroyed bone, occurred in many parts of the body as if metastatic, apparently recurred after excision, yet thanks to Mandel, if we remove a little adenoma of the parathyroid gland the patient may promptly recover from this apparently malignant disease.

Does the fibroid tumor of the uterus or breast arise only from the willful anarchy of its contained cells? Evidently not, for these tumors develop only during the period of sexual life of women, they are found only in parts that are subject to periods of marked normal hyperplasia, and their growth is prevented or arrested by castration. Like the endometrium the mammary gland undergoes an amazing hyperplasia followed by retrogression with each menstrual period. In the interim, the breast tissue is so largely fibrous that it does not resemble a gland. From the action of the follicular hormone the ducts

sprout through the gland like the branches of a perennial plant in the spring, and from the action of the luteinizing hormone the breast later flowers with the development of acini as the plant does under the sun. According to Lewis and Geschichter, an irregular action of estrin on the one hand results in cystic disease, and of progestin on the other in the lumpy thickening of the periphery of the breast which has been called chronic interstitial mastitis, Schimmelbusch's disease or adenosis. Hormones are now being used in the treatment of these aberrant growths, at times with exacerbation of symptoms. More important, perhaps, is the not infrequent mistake of the pathologist who interprets the normal monthly epithelial hyperplasia of the breast as cancerous. Even well-trained pathologists of experience have been misled; many breasts with benign lesions have been sacrificed, and statistics as to the curability of cancer have thus been rendered inaccurate. The relation of menstruation or pregnancy should be recorded with each specimen of breast tissue sent to the laboratory to aid the observer to distinguish between a normal epithelial invasion and a malignant one. The work of McFarland who has established a central registry for carcinoma in Philadelphia has in this regard been invaluable in clearing some of our diagnostic problems.

A relationship of cancer of the breast to ovarian function, long ago recorded by Beatson and then almost forgotten, is again attracting attention. Most impressive has been the disappearance of even metastatic growths from a cancer of the breast after the ovaries alone are irradiated. The desired result is unfortunately far from invariable; evidently there is an additional element yet to be discovered; yet an influence is so evident that at present we are ordering irradiation of the ovaries and at times also of the anterior pituitary for inoperable and metastatic carcinoma of the breast. It is also noteworthy that sarcomas of the breast frequently arise about the time of the menopause when there is known to be a rise in the secretory activity of the anterior pituitary.

What influence has testicular function on new growths? One of John Hunter's many observations was that the prostate gland of the hedgehog atrophied after castration. This and corroborative reports by others as to humans emboldened J. William White to propose a most unpopular, yet doubtless often efficient, operation for elderly gentlemen who suffer from prostatic hypertrophy. Compared with the result of roentgen treatment of the ovary, recent observations indicate that irradiation of the testes does not produce atrophy of the prostate, as does castration or ligation of both spermatic cords. Under irradiation the interstitial cells persist and may possibly proliferate.

The hydatidiform mole has an unpleasant tendency to develop the characteristics of cancer. It may penetrate or even perforate the uterus, and at times, secondary similar growths occur elsewhere in the body. Aschheim discovered two corpora lutei in connection with the mole instead of the single one formed in pregnancy, and it is my personal unproved opinion that the removal of these possibly abnormal corpora may be as effective in leading to the destruction of the hydatidiform mole as the removal of a normal corpus luteum in destroying the fetus. We also should study more closely the follicles of the ovaries in endometriosis, as it is possible that the resection of an abnormal follicle alone and not castration will suffice.

In general, we would say that growth in the primate is the result of the stimulation of cells by products of internal secretion. Without endocrine activity there is no growth. For the fetus until its own glands have developed cell control, a new gland of internal secretion, the corpus luteum, develops in the mother. Remove the corpus luteum in the earlier months of pregnancy and the fetus dies. With insufficient activity of the anterior pituitary, thyroid, or possibly other glands, a dwarf results. If certain eosinophilic cells of the anterior pituitary are over active, a giant growth; if of the adrenal cortex, an Herculean overgrowth with virilism follows. With certain forms of pituitary dysfunction, the giant growth affects only a member

(a toe, finger, foot, or leg) or commonly a tissue, as bone in the face, hands and feet. Occasionally the overgrowth is localized and tumor-like as exemplified in the exostoses pictured by Zondek in acromegaly. Thus a cell, a tissue, a member, or the entire body may have defective or abnormal growth through the presence or absence of secretions circulating in the blood. Of the new growths certain groups are evidently related, but we do not as yet know the nature of the hormone or the location of the special secreting gland. For example, there is a hyperplasia with disturbance of lipoid metabolism in Gaucher's disease, Neimann-Pick disease, Schüller-Christian disease, in xanthomata, and in the foam cell tumors of the jaws and tongue. It will be recalled that not many years since, splenectomy was done for Gaucher's disease in the belief that the peculiar proliferation of lipoid distended cells was malignant. Now we realize that in this disease there is a general involvement of the cells of the reticulo-endothelial system. With the Krukenberg tumor the peculiar malignant growth of signet ring cells limited to the gastrointestinal tract, both ovaries and occasionally the mammary glands, is contrary to our concepts of metastasis and suggests an underlying endocrine dysfunction. There are features about the carcinoids (argentaffine tumors), multiple chondromas and other tumors that also strongly suggest an endocrine basis. One wonders if after we have eliminated all growths due to inflammation and all due to endocrine dysfunction whether any will remain.

An organic relationship to the growth of tumors is especially suggested by the development of homologous tumors at similar ages in homologous twins. It is also noteworthy that in animals with highly developed endocrine systems tumor transplantation fails. Experiments in the transplantation of sarcoma or carcinoma rarely succeed above the biologic level of the mouse or fowl.

In youth there is the greatest stimulation and least restraint to growth in structures of mesodermic parentage, and malignant tumors springing from these tissues (sarcomas) predominate; after middle life surfaces derived from ectoderm and endoderm suffer the greatest wear and tear and require the greatest replacement, and carcinomas arise in these structures. May not the element of growth restraint wear out or pass in abeyance at this time? Growth is a response to specific hormones. If there is no hormone there is no growth.

SUMMARY

Each part of the body is transmitted from parent to offspring by genes. The growth and size of each part is dependent upon stimulation by hormones derived from ductless glands. If certain endocrine factors are absent or withdrawn, dwarfing or hypoplasia results; if the stimulating hormone is in excess, giantism or overgrowth may follow. Normally the body is cast in a chemical mold, each cell and part being held to rigid limits as to size and shape by specific chemical compounds circulating in the blood. Thus an epithelial cell, the nose, an arm, the liver, maintain a definite individual size from birth to death. Physiologic new growths of limited duration depend upon new or modified ductless glands of transient existence. For pregnancy a special gland, the corpus luteum, of short life, is called into being. If one attempts to add to the size of the body or of its individual parts by transplantation, cytolysins remove the alien elements. For successful grafting the tissue must come from the individual's own body—an iso-graft. Abnormal new growths may be called into being by the dysfunction of ductless glands and these pathological overgrowths may involve the entire body, a system, a member, an organ, a tissue, a cell or group of cells. New growths which have long been considered as benign or malignant tumors have been proved to result from endocrine dysfunction. We can no longer believe that tumors are always autogenous new growths for pathological new growths clearly arise and progress as a result of endocrine dysfunction.

APPENDICITIS

AN ANALYSIS OF 3344 CASES WITH REMARKS ON THE DELAYED OPERATION IN DELAYED APPENDICITIS*

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THIS study embraces an operative experience in our clinic of 3344 operations for appendicitis and its complications. In 1915 the writer reported 1133 operations with a mortality of 2.5 per cent. Since that report, there have been 2211 appendix operations performed by myself and my associates, Drs. W. O. Floyd and C. R. Crutchfield, with 75 deaths, a mortality for this series of 3.39 per cent up to September 1, 1934. There were 1650 acute, unruptured, subacute, recurrent, and chronic cases with 12 deaths, a mortality of 0.72 per cent. Of these, 672 were acute and 225 were performed in the first twenty-four hours. There were only 113 operations for chronic appendicitis.

Of the ruptured cases with more or less localized abscess, there were 379 cases with 19 deaths, a mortality of 5 per cent. The average duration of symptoms was 5⅓ days. Cases of generalized spreading peritonitis with gangrene and perforation numbered 186 with 46 deaths, with the mortality reaching 24.7 per cent. Of these, the average period before operation was 2¼ days; 34 of these cases had gone beyond 3½ days; one case of secondary peritonitis from a partially walled in abscess went 17 days. The appendix was incidentally removed in the course of 871 other intra-abdominal operations for practically all abdominal lesions with 20 deaths or 2.23 per cent mortality and are not included in this total. There were 6 cases of general peritonitis in which the patients were moribund, or died within a few hours after admission that were not operated upon and therefore are not included in the foregoing figures.

It is to the cause and prevention of the high death rate in peritonitis cases that this study will be directed.

The annual death rate from appendicitis in the United States is estimated at 20,000. While the mortality per hundred thousand is over 17 per cent, in England and Wales it is only 7 per cent and in France only 3 per cent.

Nashville had the highest mortality per hundred thousand from acute appendicitis of any city in the Union save two.[1] Nashville's mortality in 1932 was 39 per hundred thousand. Oak Park, Illinois, was 40.4 per cent and Salt Lake City, Utah, was 46.9 per cent. The smallest percentage in the 177 cities was Altoona, Pennsylvania, which was 2.3 per cent for a hundred thousand. Nashville serves a very large territory and the high mortality is a result of delay, purgation, and late hospitalization.

Reginald Fitz presented his epoch-making paper on appendicitis in 1886. In 1888 the mortality from appendicitis was 27 per cent. In Philadelphia the mortality of spreading peritonitis is 26.6 per cent. Boland reported a mortality rate of 30 per cent for Atlanta. It seems that surgical management of appendicitis has not been improved as it should. Wilkie[2] says that the mortality in appendicitis

[1] Hoffman, F. L. *Spectator*, Aug. 3, 1933.

[2] *Brit. M. J.*, Feb. 14, 1931.

* Read before The Atlantic County Medical Society, Atlantic City, N. J.

is as high as it was twenty years ago in spite of the increase of capable surgeons, the greater appreciation on the part of the public at large of the danger of appendicitis, extended hospital facilities, and great improvement in transport service.

The average age of the patients who die from appendicitis is about thirty-two years, at the most productive period of life, contrasted to the graver diseases, like heart disease, nephritis and cancer, which are essentially of older life.

One of our life insurance companies paid out over three-quarters of a million dollars for appendicitis deaths in 1932.

Carr and Deacon gave the mortality rate in a number of counties surveyed in Michigan as 15 per cent, and found that in other counties it was as high as 21 per cent. In Black's report of 1605 cases there were 82 deaths or a mortality of 4.88 per cent.[3] Sixty-five per cent of the postoperative deaths were due to peritonitis. Of the 9 deaths due to pneumonia, ether was used in all cases except one, in which nitrous oxide and oxygen was used.

The statistics from Lied's Clinic in Norway showed 3349 operations for acute appendicitis. In 1771 cases without peritonitis there were 6 deaths, a mortality of 0.33 per cent. Of 548 cases of localized peritonitis there were 14 deaths, a mortality of 2.55 per cent. Of 230 with general peritonitis, 63 deaths occurred, giving a mortality of 27.39 per cent. Of the abscess cases, numbering 575, there were 32 deaths, or a mortality of 5.56 per cent. The gross mortality was 3.55 per cent. Of 2134 chronic cases there were 8 deaths, a mortality of 0.37 per cent.

The Department of Public Health of Philadelphia made a vigorous campaign against the high death rate of appendicitis and considered that the three great factors for improvement were: (1) patients suffering with appendicitis must be hospitalized earlier; (2) the administration of laxatives in acute abdominal pain must be prevented; and (3) the mortality of spreading peritonitis must be reduced.

As a result of their campaign the mortality of spreading peritonitis in a period of three years has been reduced 9.5 per cent and local peritonitis 2.7 per cent. Their previous study in 1928–1929 proved that delay and the administration of laxatives caused 90 per cent of the deaths. In fact, it caused 477 of the 481 spreading peritonitis deaths, as 437 of these patients took laxatives and developed spreading peritonitis and died. It was found that if a patient had taken a laxative he had only one chance in seven to recover. As a result of the prophylactic campaign in Philadelphia, the death rate was reduced from 5.97 per cent to 4.81 per cent, and in the next year, 1931, it was reduced to 4.39 per cent, a saving of 34 lives. This was a tribute to early hospitalization which on an average was 12.8 hours earlier.

The report also showed: that of those patients admitted to the hospital within twenty-four hours, 1 in 46 died; between twenty-four and forty-eight hours, 1 in 21 died; between forty-eight and seventy-two hours, 1 in 14 died; after seventy-two hours, 1 in 10 died. Of those that received laxatives, 1 in 14 died, and of those who did not receive laxatives, 1 in 112 died.

Of those who were admitted to the hospital with spreading peritonitis, the deaths were 28.95 per cent. Of the deaths from spreading peritonitis, the average time between onset of symptoms and removal of the appendix was 57.5 hours.

To aid in the dissemination of this knowledge and in an effort to prevent unnecessary sacrifice of life, the Philadelphia County Medical Society sent stickers to all of their members to be affixed to their monthly statements to patients. The sticker read as follows:

WARNING:

In the Presence of Abdominal PAIN
Never Give a LAXATIVE
Give Nothing by Mouth
Apply ICE or HOT Water Bottle
CALL Your Family Physician.

[3] *Illinois M. Jour.*, March, 1933.

The death rate from appendicitis in twenty-six cities of over 300,000 population in 1931 showed an average of 17.36 per cent. The United States had the distressing number of 23.3 deaths per 100,000. Between the years of 1913 and 1923, Philadelphia had 18.

There is no disorder of the human body in which surgical judgment influences the outcome so frequently or so markedly as general peritonitis. The results of twenty-seven hospitals in Philadelphia, where 364 surgeons were operating (an average of 13 to a hospital) a certain number had no mortality. In one hospital the mortality rate was 11.2 per cent. Several surgeons in this group had no mortality. One had a mortality of 20 per cent and another had 3.3 per cent. The mortality for appendicitis decreases with the experience of a surgeon.

Bowers considers that the family physician is a prophylactic surgeon. "Typhoid fever has been controlled and diphtheria is being eradicated. It is time for the campaign for prophylactic surgery to be instituted for appendicitis."[4]

Lowe said that 38 per cent of all patients showing perforation of the appendix, 37 per cent had either been given castor oil, pills or salts by members of the family or by the physician.[5]

In the diagnosis of appendicitis we find the symptoms and signs occurring in pairs: pain and vomiting, pain being the first to appear; tenderness and rigidity; temperature and leucocytosis. It is the absence, delay of appearance, differing in intensity, and wide variations in these symptoms that sometimes makes the diagnosis and its differentiation difficult.

Bowers concludes from his studies of the appendicitis problem in Philadelphia that, (1) only one symptom is always present—pain; (2) only one sign is uniformly present—tenderness (absent in 11 per cent); (3) there is only one corroborative test—leucocyte count (absent in 20 per cent).

Sydenham, in the seventeenth century, made the statement that at the commencement of iliac passion, as it was called up until the eighteenth century, the pain was not fixed, but that later it settled to one spot and remained there. Classical symptoms are not always present and are not always in the usual order of appearance. They may differ in intensity and have wide variation, making differentiation at times very difficult. The usual straightforward, unmistakable, and easy type of diagnosis is familiar. It is the mild, the atypical, the irregular case that is confounding.

When pain ceases suddenly it may betoken gangrene, especially when other symptoms continue and only the pain stops. When the pain is very severe and it stops suddenly we fear perforation. It is the lull before the storm—peritonitis. Continuous vomiting that is persistent usually means some complication; perforation, gangrene, peritonitis, or obstruction. Rigidity is a valuable sign. It often corresponds to the point of greatest tenderness. It is best obtained over the lower portion of the right rectus muscle. Chill nearly always means gangrene. Very high temperature, especially if it precedes pain, makes one think that it may not be the appendix. The initial pain is due to distention of the appendix.

Perforation is relatively much greater in frequency in children than in elderly people. Young children cannot describe the pain very accurately and perforation is likely to ensue before the condition preceding it is recognized. Tenderness and rigidity are the most dependable signs. They require even more prompt treatment, if possible, than adults. The well-known syndrome of abdominal pain in lower right-sided pleuropneumonia makes diagnosis of great import in children. It requires a good deal of discrimination to rule out the appendix before the pneumonia is a frank one. If one operates and

[4] Bowers, J. O. *J. A. M. A.*, May 12, 1931.
[5] *J. A. M. A.*, July 11, 1931.

finds little or no evidence of appendicitis, it is tragic. It is unfortunate in the presence of an upper respiratory infection if the appendix is after all the guilty organ. An abnormally high blood count in the early stages points to the lung.

Pelvic abscess from appendicitis can be diagnosed by a hydrorrhea from pressure on the rectum with a discharge of mucus. The anus is patulous. This is also a useful symptom and a useful sign in postoperative complications, which are often due to residual abscess in the pelvis and can be readily evacuated through the rectum with relief. Some of these cases perforate themselves and I have even known them to do that after a suprapubic operation had been done because the pressure necrosis had proceeded so far.

Wilkie, in 1914, called attention to the two types of appendicitis: namely, the interstitial variety, where the inflammation was in the wall itself; and also and more important, the acute obstruction, usually at the base of the appendix, often with an enterolith, giving gangrene from overdistention and acting really as an obstruction in the intestine would. It is the closed loop type. These are the cases that eventuate into gangrene on account of interference with the circulation as well as obstruction of the lumen, which makes of the appendix a test tube for the rapid production of toxic products and, as we have often encountered, the perfectly sphacelous appendix. Gangrene happens as early as six hours and usually before twenty-four hours. This, in Wilkie's experience, gives rise to 90 per cent of the deaths, and this is what is usually referred to as gangrenous, perforated appendicitis. In our series, it gave 24.7 per cent mortality. Thus we see the utter futility of disregarding the warning of colic and of administering what turns out to be a fatal dose of castor oil. It is terrible for the family and layman to give purgatives, but it is extremely reprehensible and peculiarly unfortunate that it should ever be the deliberate treatment of a physician. Patients often commit the fatal error of sending for the castor oil bottle instead of sending for the doctor.

The cases in which the patients are severely sick from the start, with great and continuous pain, with persistent vomiting, are indicative of obstruction of the lumen of the appendix. This is to all intents and purposes an intestinal obstruction, ending in the death of the appendix, with almost certain gangrene and perforation unless promptly operated upon. Even when such a severe pain ceases spontaneously, it often means that perforation has occurred and that peritonitis will soon follow.

The most serious mistake the doctor makes is in thinking the case although appendicitis, is hardly bad enough to be operated upon. No case, provided that it is appendicitis, is too mild to be operated upon. We often regret that a patient has been operated upon too late, but rarely that he has been operated upon too soon. The danger is that when the symptoms which indicate a progressive process appear, the operation then becomes extremely dangerous because of gangrene, perforation or peritonitis.

Theoretically, if every patient could be operated upon within the first twenty-four hours, the terrible death rate of appendicitis would be a thing of the past. There sometimes seems to be reason, real or imaginary, why the patient is not operated upon early; then the probabilities are that all chances for a clean early operation have vanished. In all suspicious cases the patient should at least be hospitalized so that a thorough study can be made.

Everybody is greatly concerned when the signs of extension of the disease have come about and the patient is rushed to the hospital during the fatal third or fourth day. Really, it is not improbable that certain of those cases would be better off if not operated upon in that particular period. Many men of long experience can recollect numbers of patients who were extremely ill and who were not operated on in those days and who got well. It is not

just a haphazard recollection. Sir James Berry[6] of London says that when he was a house-surgeon at St. Bartholomew's Hospital, 31 patients were admitted with perityphlitis, as appendicitis was then called. They were mostly bad cases with considerable swelling and only one out of the 31 died. It is difficult to say which is the worse treatment—the purgative treatment early or the surgical treatment late. If both were omitted and the safe ground of early operation could be substituted, the appendicitis massacre would be a memory. When early, safe period for operation has been frittered away, then conservative treatment is at times most judicious. King Edward IV was operated on on the eighth day, only when abscess appeared and was definitely localized. The appendix was not even removed. He was drained and lived eight years. If that wise treatment had not been applied and he had been operated upon the third or fourth day, he might not have lived and ruled the eight years following his operation. If judicious treatment is good enough for a king, it should be good enough for others.

There is no conservative treatment, however, after a purgative has been given, in the majority of cases. These patients must be operated on and must take the consequences. Ochsner told me himself that he never applied his waiting policy in the delayed cases if they had had purgatives. Lord Moynihan says, "If no aperient has been given, starvation, opium, absolute rest may enable a deliberate and easier choice be taken in favor either of operation or delay until resolution or suppuration occur," and adds that ruthless operations, with large incisions and a mind set upon removal of the appendix when an abscess is opened, are entirely out of place. These views of his apply to the neglected, delayed case because his belief, like that of most medical men and surgeons, is that early operation is ideal.

The Ochsner treatment, also called the Ochsner-Sherren treatment in England, was designed to avoid immediate interference in delayed cases and to bring about localization or resolution. Ochsner's rule number one was to operate upon every case in the beginning of the attack if a suitable hospital and surgeon were available. On account of the notoriously high mortality in the third and fourth day cases, he taught that such cases were better delayed than to have an operation at a period before nature had been able to do her share in the protection of the patient. All of the older surgeons saw many severe cases which had undergone resolution. Now no severe case is permitted to undergo resolution. The more severe the case the more certain is it to have operation and the higher the death-rate. No case must die without "benefit of clergy." The older surgeons noticed that many of these patients would get well although they left the hospital with a lump in their sides. Every practitioner has seen many cases of abscess of the appendix and all surgeons have had a uniformly good result where the abscess had become well localized and was operated on anywhere from the tenth to the fourteenth day. If, by good fortune, the abscess was adherent to the abdominal wall, which simply required incision and evacuation, they practically all got well. Heister found the appendix lying among adhesions in an unopened abscess in an autopsy which he performed in 1711.

The surgeon should refrain from removing an appendix not easily found in an old walled-off abscess. To dig out an appendix is not indicated where nature has spent ten days in walling it off, and in ten minutes, if the surgeon succeeds in breaking through the wall of the localized abscess, he is likely to scatter the infection broadcast. If, fortunately, an enterolith is in the abscess cavity (our sponge nurses have been taught to look for them), we expect a patient to have no further trouble even though the appendix is left. On the average, about half of the abscess cases where the appendix is left in, never have any recurrence; the other half can be

[6] *Lancet*, p. 1027, 1932.

operated upon safely in a few weeks or in the early stages of a recurrent attack should they have it. If operation had been neglected in early period, Ochsner advised delay, the withholding of purgative and of food. By pursuing this course he had a very low mortality. At the present time, we are prone to operate upon patients when first seen, irrespective of the time or the severity of their general condition. The time element is dangerous and if the patient has been allowed to procrastinate until the infection is no longer limited to the interior of the appendix but has a wider and more extensive condition of suppuration and an abscess which is only partially walled off, then the high death rate occurs. The difficulty is that if a patient should die under non-operative treatment, the surgeon and all concerned come in for very severe criticism.

If one starts out on the Ochsner plan of non-interference because a patient has come too late for the early operation and too early for the late operation, then he should not change horses in the middle of the stream and operate upon the patient while the condition is still severe. If it does become localized one can wait with greater safety and perform the operation at a better period. We have done that in a number of our cases. It is particularly indicated when the patient is in bad condition. It should be a rule that complete laboratory work should precede an operation. It is an emergency to be sure but the real emergency should be in the first twenty-four hours of the disease. Patients who have acidosis from vomiting, who have high blood urea, whose general condition is unsatisfactory, and great distention exists, can be gotten into a better condition by judicious preoperative management. The Ochsner treatment is a modus vivendi remedy to get rid of the danger of operating when nature really could take better care of the infection for a period and to avoid the great danger of disseminating the infection by invasion. We sometimes do the right thing at the wrong time. Surgery should not be asked to bear the brunt of delayed operation, neglect, purgation, and mismanagement.

Black says that any patient with appendicitis which has a distended and rigid abdomen, albumin, casts, diacetic acid and acetone in the urine, and a kidney function below 35 per cent, must be recognized as one with spreading peritonitis and should not be operated upon until those conditions can be improved. He advises "intra-abdominal rest, with morphine, and rehydration with intravenous glucose and chlorides. Fluids are given in every way. Often vomiting interferes with taking of fluids by mouth. The rectum is not always a satisfactory route for glucose. The intravenous glucose is given by the continuous method."

Le Grand Guerry, who practices the delayed operation in the bad second, third and fourth day cases for preparation or to give time for localization or, any name one wishes to give the plan, to tide over the really delayed case so operation will not be performed at the most dangerous period, reports 850 cases of acute, unperforated appendicitis, 750 gangrenous, perforated appendices with localized abscess, with a mortality of 0.1, per cent; general peritonitis 9.10 per cent; third and fourth day cases postponed and deferred operation, mortality about 2 per cent.

When a mass is felt in the right lower abdomen in the first thirty-six or forty-eight hours of the disease, it usually means that the appendix is wrapped in the omentum, as a burning child is wrapped in a wet blanket, and forms the induration that can be felt. It is too soon for the inflammatory mass other than that contained in the omentum. Localized abscesses can only be palpated in the later days of the disease. Sometimes the appendix can be removed without taking it out of the omental wrapping by division of the omentum. In the simpler cases, it can be unwrapped and the omentun, if not badly infected, can be left with safety, as it is water-logged with inflammatory defensive

bodies against infection, which are helpful in the continued repair.

Cases which are admitted with evidences of localization manifested by a mass in the right side require a great deal of judgment in reference to operation. We have been able to carry many of those cases through and the abscess has become well walled off and easily evacuated and have delayed operation until such period. One case of a week's duration had a mass to be felt above the umbilicus and through the rectum in a young man. We felt that it should be evacuated, but after removal to the hospital his condition improved. Greatly to my surprise, the mass within two weeks entirely disappeared. The patient returned some eight weeks later for the removal of an appendix in the interval. Surprisingly few adhesions were seen.

The work of Wallace and Sargent, St. Thomas Hospital, London, showed that in cases admitted with palpable mass, where operation was performed, the mortality was 7.9 per cent and there were 17.1 per cent complications. In approximately the same number of cases not operated upon, the mortality was only 0.68 of one per cent and 0.76 per cent of complications. Of 487 cases admitted with palpable mass, those who were operated upon with appendix removed and drainage gave a mortality of 15.4 per cent and those who were drained only gave a mortality of 4.03 per cent. Of this number, 163 returned for operation after the mass had subsided and only 2 died. These unexcelled statistics seem to prove the wisdom of conservative management of late cases where nature has attempted to enclose them by adhesions.

The mortality for cases of peritonitis, which had the appendix removed and drained, was 18.6 per cent. Those cases in which the appendix was removed without drainage gave a mortality of 20.8 per cent. In that hospital in the earlier period from 1894 to 1903, the mortality was 42 per cent, but in the last ten years, 1920 to 1929, the mortality was only 4.9 per cent, taking all cases, good, bad and indifferent.

Hippocrates evidently referred to appendicitis when he wrote, "Suppurations upon a protracted pain of the parts about the bowels is bad."

The most dangerous position of the appendix to occupy is in the pelvis. Black reports[1] that half of his patients who died from generalized peritonitis the appendix was in the pelvis. These cases are difficult of diagnosis and require vaginal and rectal examination, which should always be routine.

It is the retroperitoneal cases that slowly develop an abscess, which is often called, on account of its location, a perinephritic abscess. The urinalysis will nearly always rule renal lesions out. One might say that over half of the cases of perinephritic abscesses on the right side are due to retrocecal appendicitis with abscess.

SUMMARY

In order to reduce the unwarranted and unnecessary mortality in appendicitis, we must:

1. Operate in the early hours of the disease even though it might be regarded as a mild attack.

2. Teach families to avoid purgatives in every case of abdominal pain.

3. Consider each case individually, do complete laboratory work and give adequate preparatory treatment rather than follow an iron-clad rule to operate on delayed cases of appendicitis irrespective of the patient's condition as a hurried midnight emergency operation.

4. Remember the emergency is in the first few hours.

5. In many instances, delay in delayed cases of appendicitis is the part of surgical wisdom.

[1] *Brit. M. J.*, p. 1137, Dec. 24, 1932.

THE ELLIOTT TREATMENT OF PELVIC INFLAMMATORY DISEASE

A REPORT OF 101 CASES

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DURING the past two decades the era of surgical radicalism has given way to the era of conservatism in the management of pelvic inflammatory disease. The modern era was inaugurated by Frank F. Simpson,[1] who, in 1909, reported a series of 456 cases of salpingitis treated surgically after a delayed period of conservative treatment, with a mortality rate of 1 per cent. This was in sharp contrast to the prevailing mortality rates of 15 to 20 per cent, which Simpson attributed to immediate surgical intervention in cases of acute salpingitis. In the same year, Crossen[2] published almost identical observations and emphasized the necessity of distinguishing between the clinical manifestations of pelvic inflammatory disease due to gonococci and that due to streptococci. He stated that gonococci affect primarily the fallopian tubes, with secondary involvement of the ovaries and pelvic peritoneum, resulting in pus tubes or tubo-ovarian abscesses, which usually become sterile, or in which the gonococci are replaced by other pyogenic organisms within a few weeks. Streptococcal infections, on the other hand, usually penetrate the wall of the uterus and spread by continuity to the adjacent pelvic organs. In such cases the virulence of the streptococcus persists for long periods and the resulting abscesses rarely become sterile.

The researches of Curtis[3] demonstrated that the gonococcus disappears from fallopian tubes in approximately fifteen days after the symptoms of acute infection have subsided. Acute exacerbations, in such cases, are usually the result of reinfection. Curtis expressed the belief that conservative non-surgical measures would result in clinical cures in 85 per cent of the cases if reinfection was avoided. Other observers, notably Miller[4] and Aldridge,[5] lent their support to the thesis of conservatism.

While pelvic surgery is successful in some instances, all surgeons recognize the fact that there are many women who are left in a state of semi-invalidism for the greater part of their lives following surgical intervention. During the past few years there has been a diligent search for some form of therapy which would be effective in a higher percentage of cases. Such non-surgical measures as vaccine therapy, foreign protein therapy, pelvic massage, prolonged hot douches, and diathermy have been advocated. Each of these methods has proved its worth in many cases, but it has been recognized that each has its limitations.

The value of heat as a therapeutic measure in the treatment of pelvic inflammatory disease has long been recognized. Hippocrates advocated the use of the hot douche, not only as a hygienic measure, but also for the relief of pelvic pain. Galen and Celsus rediscovered its value 1000 years later. German physicians, in order to increase the duration of therapeutic heat in the pelvis, heated lead shot and poured them into the vagina. Gellhorn[6] demonstrated that the mucous membrane of the

vagina was more resistant to high temperatures than was the skin of the vulva and perineum. He recommended douches with two gallons of water at a temperature of 115° to 120°F., with protection of the genitalia and perineum with petrolatum. With this treatment he was able to relieve the symptoms of a high percentage of his patients without operation. There appears to be no question as to the value of such sustained high temperatures by the douche method. Yet there are important difficulties in keeping the temperature constant, giving the douche over a sufficiently long period of time and adequately controlling the intravaginal pressure. These factors make self-administration almost impossible and require intelligent nursing care.

By the use of medical diathermy, Cherry[7] was able automatically to control the temperature in accordance with the tolerance of the patient. He reported a series of 100 cases of pelvic inflammatory disease with 72 per cent cured or improved. He attributed his success to the lethal effect of the increased local temperature upon the gonococcus. Scheffey and Schmidt[8] reported similar results, but attributed them to the increase in local circulation accompanied by a marked increase in phagocytosis and local tissue metabolism. There are, however, objections to the diathermy method. The rugae of the vagina are not obliterated by distention so that the increase of local temperature is not uniform, thus increasing the danger of burns to the mucosa.

In 1920, Charles Robert Elliott devised the crude ancestor to the present apparatus which bears his name. It consisted of a rubber bag fitted into the vagina and distended by hot circulating water in a closed system with control of water pressure and temperature. The therapeutic principles have remained the same but important mechanical refinements have been made in the apparatus. The present Elliott machine consists of a small water tank, heated by an automatic thermostatically controlled heating element and two electrically driven pumps, one positive and one negative, with automatic pressure control and circulation of the water at the rate of about four gallons per minute.

In the cases which form the subject of this report treatment was begun at water temperature of 110°F. and gradually increased to a maximum of 125° to 130°F. Ordinarily the temperature was elevated one degree each one and one-half minutes. The water temperature was then maintained at the maximum level for thirty to forty minutes. The water pressure was maintained at 1½ to 2 pounds depending upon the tolerance of the patient. The duration of each treatment was one hour. It was observed early in the course of this study that there is considerable variation in tolerance to various levels of temperature, pressure and duration of treatments. During the first one or two treatments it is frequently necessary to use lower temperature (120–125°F.) and pressure (1½ lb.). Higher temperature and pressure may then be employed in subsequent treatments. Both ambulatory and hospitalized patients were treated; the great majority were ambulatory. All patients were kept in the treatment room at rest in bed for thirty minutes to one hour after each treatment. Cervical smears, blood counts, and sedimentation rates were made on all patients at the beginning of the course of treatments and at regular intervals thereafter. Complete diagnostic surveys, including careful pelvic examinations and visual examinations of the vagina and cervix, were done on all patients.

Vaginal examination immediately after the Elliott treatment reveals a pronounced and prolonged hyperemia of the entire mucosa covering the vagina and cervix, accompanied by a tremendous increase in vaginal and cervical secretions. After two or three treatments there occurs a very distinct broadening, shortening and softening of the cervix. The first symptomatic change is the diminution in pelvic pain and tenderness; this is ordinarily

observed after the second or third treatment. Many patients obtain distinct relief after the first treatment. After four to six treatments the mobility of the uterus is greatly increased and the adnexa become more easily palpable. Daily treatments (excepting Sundays) for a period of two weeks were regarded as a minimum course. At the end of the first two weeks patients were then individualized depending upon the response. The average number of treatments in this series was 19. In occasional cases it is necessary to continue the daily treatments for at least one month.

In a series of 43 cases of chronic pelvic inflammatory disease Counseller[9] reports that in 24 cases in which Elliott treatment alone was used the results were good in 14 (58.3 per cent), fair in 3 (12.5 per cent), and poor in 7 (29.2 per cent). For the entire group 70.8 per cent of the patients obtained satisfactory results. Among the 7 cases in which the response was poor, 3 had associated conditions unrelated to pelvic disease and the remaining 4 did not receive adequate treatment. In 19 operative cases, in which an average of 12 daily Elliott treatments were employed during convalescence, good results were obtained in 16 instances (84.2 per cent) and fair results in 3 (15.8 per cent). The end-results for the combined Elliott therapy-surgical group were satisfactory in 100 per cent.

In a discussion of the Elliott treatment in pelvic inflammatory disease, Graham[10] states: "Our records show almost uniform improvement in every case of pelvic inflammatory disease that has been thus treated." Jacobs, Vaughn and Gellhorn[11] also report similar good results.

The series of patients providing the material for this report were treated over a period of one year, from July, 1933, to July, 1934, on both the public and private services of the Miami Valley Hospital. The results have been classified as good, fair, or poor. Good results were regarded as those in which the patient obtained apparently complete resolution of the pelvic inflammatory process, with complete freedom of symptoms. Those patients who received definite benefit, but in whom mild symptoms or signs of the pelvic disease persisted, were regarded as having received a fair result. Those patients who received little or no benefit from the treatment were designated as having obtained poor results. A classification of the 101 cases will be found in Table 1. It will be seen that in the group of 27 cases of chronic salpingitis, good results were obtained in 17 (62.96 per cent), fair results in 7 (25.92 per cent), and poor results in 3 (11.11 per cent). One patient who obtained a fair result was subsequently operated upon and a right parovarian cyst was removed, following which the patient obtained complete recovery. Of the 3 patients who obtained poor results, 2 received inadequate treatment. If the good and fair results are grouped together satisfactory results were obtained in 88.8 per cent of this group.

Of the 15 cases with acute exacerbation of chronic salpingitis, 3 had large pelvic abscesses, in 2 of which the upper border of the abscess extended to the level of the umbilicus. The response to Elliott treatment, without any other form of treatment in these cases, was particularly striking. In all 3 cases the abscesses promptly resolved and no evidence of pelvic disease was present when these patients were dismissed. One patient was treated following bilateral salpingectomy. Treatment was begun on the third day following operation and her convalescence was entirely satisfactory. The results for this group were found to be good in 80 per cent, fair in 13.33 per cent, and poor in 6.66 per cent. Satisfactory results were obtained in 93.3 per cent of the patients in this group.

In 10 cases of acute and subacute salpingitis, good results were obtained in 60 per cent, fair results in 30 per cent, and poor in 10 per cent. Satisfactory results were obtained in 90 per cent of the patients in this group.

In 4 cases of cul-de-sac abscess, treated by the Elliott method following surgical drainage, good results were obtained in all.

Ten patients were treated who had had previous pelvic surgery for the removal of pelvic inflammatory disease, but in which only temporary relief followed. ease grossly or microscopically. The history and examination of the patient at the time of admission left no doubt that the original source of infection was in the uterus and adnexa, although all evidence of pelvic infection was absent at the time of postmortem examination.

Table 1

Diagnosis	*Number of Cases*	*Average Age*	*Average Duration of Pelvic Disease*	*Average Number of Treatments*	*Results*					
					Good		*Fair*		*Poor*	
					No.	*Per Cent*	*No.*	*Per Cent*	*No.*	*Per Cent*
Chronic salpingitis	27	25.6	26.8 months	23	17	62.96	7	25.92	3	11.11
Acute exacerbation of chronic salpingitis.	15	27.6	Chronic 2½ yrs. Acute 2 weeks	25.1	12	80.00	2	13.33	1	6.66
Acute and subacute salpingitis	10	20.9	15 days	21.4	6	60.00	3	30.00	1	10.00
Cul-de-sac abscess	4	24.7	3 weeks	16.5	4	100.00	0	0	0	0
Postoperative residue	10	28.5	3.2 years	17.9	5	50.00	5	50.00	0	0
Infected abortion	11	26.8	11.5 days	16.6	10	90.90	0	0	1	9.10 (Death)
Postpartum infection	4	24.5	12 days	12.6	4	100.00	0	0	0	0
Endocervicitis	8	27.8	18 months	17	4	50.00	3	37.50	1	12.50
Retroversion and subinvolution	6	33	1 year	18	4	66.60	2	33.30	0	0
Gonococcal vaginitis	4	7.2	12 days	29.5	1	25.00	3	75.00	0	0
Acute streptococcus infection of pelvis with streptococcus septicemia.	1	23	3 weeks	3	0	0	0	0	1	100 (Death)
Trichomonas vaginalis vaginitis	1	35	?	17	1	100.00	0	0	0	0
Totals	101	....	.....	19	68	67.33	25	24.75	8	7.92

The average length of time since operation was 3.2 years. All were improved. The results were interpreted as good in 50 per cent of the cases and fair in 50 per cent.

In 11 cases of infected abortion the results were good in 10 cases and poor in one. In the one case in which there was a poor result, the patient died after three weeks of hospitalization, during which time 17 Elliott treatments were given. Streptococcus hemolyticus was found repeatedly in blood cultures. Postmortem examination revealed the usual findings of streptococcus septicemia, but the uterus and the adnexa showed no evidence of inflammatory dis-

Four patients with postpartum infection, who had had temperatures of 101°F. or more for at least two days before treatment was instituted, obtained good results.

Eight patients with chronic cervicitis and endocervicitis with varying degrees of erosion were treated. Good results were obtained in 50 per cent of the cases, fair results in 37.5 per cent, and poor results in 12.5 per cent. Satisfactory results were obtained in 7 (87.5 per cent) of cases.

Six patients with enlarged, retroverted soft and tender uteri were treated by the Elliott method alone. All were improved. In 4 the results were interpreted as

good and in 2 they were regarded as fair.

Our experiences in 4 cases of gonococcal cervicitis in children with the Elliott treatment have been disappointing. In all of the patients the acute symptoms subsided rapidly and the actual number of gonococci found on smears was greatly decreased after three or four treatments. In only one instance, however, do we feel that the Elliott treatment alone effected a cure. In the other 3 cases what was regarded as adequate Elliott therapy was followed by injections of theelin. All evidence of the disease disappeared in 2 of the cases after ten daily injections of 75 rat units of theelin. The fourth patient is distinctly improved, but occasional gonococci are found in vaginal smears even after both Elliott and theelin therapy.

One patient with acute post-abortal streptococcus pelvic infection was admitted in a moribund state and died three days after admission. The progress of the disease was apparently uninfluenced by the Elliott treatments.

One patient with intractable trichomonas vaginalis vaginitis responded promptly to Elliott treatments. In this instance the temperature of the applicator was run somewhat higher than usual during the first treatment with the result that the patient developed a severe burn of practically the entire vaginal mucous membrane. Daily treatments were continued at a lower temperature with complete healing of the burned areas; no scar resulted.

The results obtained in the various age groups will be found in Table II. The youngest patients, from five to ten years of age, were treated for acute gonococcal vaginitis. There was no evidence that the age of the patient exerted any influence upon the result. In Table III may be found the tabulation of results according to the duration of pelvic inflammatory disease. It is apparent that the highest percentage of good results may be expected in the acute and subacute forms of the disease.

The erythrocyte sedimentation rates were studied throughout the course of treatment of 77 patients, in order to determine whether or not this test would provide a reliable index of resolution of the inflammatory process. In comparing the changes in sedimentation rate with the clinical response it was found desirable to arrange the patients into five groups. These results are summarized in Table IV. In group I were placed those patients who exhibited no change in sedimentation rate during or at the end of treatment. Group II includes those patients whose sedimentation rate progressively increased during the course of treatment. In Group III are placed those patients who showed an initial

TABLE II
RESULTS ACCORDING TO AGE

Age	*Number of Cases*	*Results*		
		Good (Per Cent)	*Fair (Per Cent)*	*Poor (Per Cent)*
5 to 10	4	25.00	75.00	0
15 to 19	11	72.72	27.27	0
20 to 24	37	67.56	16.21	16.21
25 to 29	21	66.66	33.33	0
30 to 35	16	62.50	25.00	12.50
Over 35	10	90.00	10.00	0
Unknown	2	50.00	50.00	0
Totals	101	67.33	24.75	7.92

TABLE III
RESULTS ACCORDING TO DURATION OF CONDITION

Duration	*Number of Cases*	*Results*		
		Good (Per Cent)	*Fair (Per Cent)*	*Poor (Per Cent)*
1 to 13 days	33	72.72	18.18	9.09
2 weeks to 3 months	16	81.25	12.50	6.25
3 to 11 months	13	61.53	23.07	15.38
11 to 23 months	11	54.54	36.36	9.09
2 to 3 years	9	66.66	33.33	0
Over 3 years	14	57.14	35.71	7.14
Unknown	5	60.00	40.00	0
Totals	101	67.33	24.75	7.92

TABLE IV
CORRELATION OF ERYTHROCYTE SEDIMENTATION TESTS WITH CLINICAL RESPONSE

Group	Number	Results		
		Good (Per Cent)	Fair (Per Cent)	Poor (Per Cent)
I	9	77.77	22.22	0
II	13	30.76	53.84	15.30
III	6	66.66	33.33	0
IV	11	72.72	27.27	0
V	38	81.57	15.78	3.42

increase in sedimentation rate, followed by a decrease, but with a more rapid final sedimentation rate than at the beginning of treatment. In group IV were placed those patients who showed an increased sedimentation rate, followed by a decrease in which the final sedimentation rate was equal to or slower than the initial rate. In group V appear those patients in whom there was a progressive decrease in sedimentation rate; all of the patients in this group had an initial sedimentation rate of 60 minutes or less. The highest proportion of good results was obtained in group V. In 49 cases, or approximately two-thirds of the total number, the clinical response and the decrease in sedimentation rate paralleled one another.

In 12 adults in this series cervical smears were found to contain gonococci; of this number 11 became negative and remained so following Elliott therapy. The single exceptional patient was suffering from acute exacerbation of chronic salpingitis, probably due to reinfection. It seems probable that an inadequate number of treatments was carried out in this case. A comparison of cervical smears taken immediately after treatment with those taken just prior to treatment showed a marked degeneration of pus cells and organisms, with a marked increase in the amount of mucus.

Burns of the vaginal mucosa occurred in 12 cases. In only 2 of these were the burns regarded as severe. Treatment was continued in all of these cases as suggested by Cosgrove and Waters.[12] All healed promptly. Burns may usually be attributed to faulty technique. Great care must be taken in the insertion of the latex vaginal applicator in order to obtain uniform distention. This treatment cannot be carried out successfully by haphazard indifferent workers. The technique is simple but it must be thoroughly mastered.

Our experiences lead us to the belief that Elliott therapy may be employed with a high proportion of satisfactory results in any type of pelvic inflammatory disease. We have not regarded menstruation as a contraindication to daily treatments. Exacerbations of pelvic inflammatory disease not infrequently occur during menstruation. Several patients with a history of dysmenorrhea obtained complete relief when the treatments were continued during the menstrual period. It was noted that if the patient was just beginning to menstruate before treatment that the menstrual flow would be well established at the end of treatment.

SUMMARY AND CONCLUSIONS

1. In a series of 101 cases of pelvic inflammatory disease good results were obtained in 67.33 per cent, fair results in 24.75 per cent and poor results in 7.92 per cent. Satisfactory improvement was obtained in 92.08 per cent of cases.

2. In a group of 52 cases, including chronic salpingitis, acute exacerbation of chronic salpingitis, acute and subacute salpingitis, good results were obtained in 67.31 per cent, fair results in 23.08 per cent, and poor results in 9.61 per cent. Satisfactory results were obtained in 90.37 per cent of this group.

3. In a group of 49 cases, comprising various types of pelvic inflammatory disease, good results were obtained in 67.35 per cent, fair results in 26.53 per cent, and poor results in 6.12 per cent. Satisfactory results were obtained in 93.87 per cent of the patients in this group.

4. The highest proportion of good results was obtained in the acute and subacute forms of pelvic inflammatory disease, with duration of less than three months. The age of the patient exerted little influence upon the results.

5. The erythrocyte sedimentation rate was found to be a reliable index of the resolution of the inflammatory process in approximately two-thirds (63.63 per cent) of a group of 77 patients.

6. Gonococci disappeared from the cervical smears of all but one of 12 adult patients. Gonococcal vaginitis of children was found to be refractory to Elliott therapy in 3 of 4 cases. The addition of theelin therapy eliminated evidence of the disease in 2 of these cases.

7. Satisfactory results may be anticipated in the great majority of cases of pelvic inflammatory disease regardless of etiology or duration.

8. Approximately 9 out of 10 patients with pelvic inflammatory disease may be treated successfully with Elliott therapy, without recourse to surgical intervention. In the few cases in which complications make surgery necessary, Elliott therapy before and after the operation will greatly enhance the likelihood of prompt and favorable results.

9. Hospitalization is not required in the majority of cases.

10. The technique of Elliott therapy is simple, but requires adequate training of personnel.

Note: The authors wish to express their indebtedness to the Mesdames Marguerite Cook and Thelma Carpenter, physiotherapists, for their skill in carrying out these treatments, and to the physicians of Dayton for their cooperation.

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COMPLETE THYROIDECTOMY IN ADVANCED HEART DISEASE

WITH OBSERVATIONS ON ITS USE IN ADVANCED ARTERIOSCLEROSIS, SYPHILIS AND RENAL DISEASE*

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THE physiological connection between the thyroid gland and the heart has been known for thousands of years, but a complete understanding of all the functional and pathological links is far from settled. We find the Chinese, one thousand years before Christ, treating patients with heart trouble with sponge ash, high in iodine content, and obtaining marked improvement. Through the dark centuries, and well into the Middle Ages, iodine in various forms was used therapeutically in the treatment of both goiter and heart trouble, thus showing an early suggestion of the close relationship between these two organs. As in other endocrine subjects, only the surface has been touched and each investigation brings new factors to light. When all the studies are completed, they may show that we are asking the "mountain to come to Mahomet" by our backward attack of the problem. Only by tottering steps, however, does Science advance, and perhaps this subject may be one of these faltering strides, which, with the gathered strength of experience, will point the way to the "mountain." In any event, it brings us a different conception of an old condition, and this is always a worthy study.

All of us have been impressed with the rapid recovery of the overloaded heart in thyrotoxicosis following the accepted treatment of subtotal thyroidectomy. As surgeons, we have seen many cases in which, after removal of a gland, normal in appearance, there has been a marked improvement in the clinical picture of the patient with the disappearance of signs of decompensation. Consciousness of this fact has caused us to recommend thyroidectomy in many instances where there was a reasonable doubt as to the true goiter lesion. The improvement, often of a miraculous nature, in patients even without serious thyroid pathology has been observed and mentioned in the literature many times. Thus we find Hamilton in 1921 stating that the response to subtotal thyroidectomy in patients with congestive heart failure was "unique," while Babcock has always advocated total thyroidectomy in goiters when the cardiac lesion was advanced. Morris and Crile and others noted that the basal metabolic rate could be within normal limits and excellent results still be expected from thyroidectomy. Various terms such as "masked thyroid disease," "internal goiter" etc. were used to designate the unexplained phenomena. After years of study of the velocity of blood flow, the articles by Blumgart and associates at Boston on the value of complete thyroidectomy in congestive and coronary heart disease, without actual thyroid pathology, crystallized thought on the subject and again spurred the work in that direction. A liberal summary of their conclusions seems in point in any work on complete thyroidectomy.

After a study of the velocity of blood flow in over 600 subjects, Blumgart and his

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associates came to certain definite conclusions which are briefly summarized:

1. The velocity of blood flow is more easily measured than any minute volume output at the heart and is perhaps as nearly accurate a guide as to cardiac efficiency as we have.

2. The velocity of blood flow is directly determined by the metabolic demands of the body.

3. The metabolic demands of the body are gauged by the metabolic rate.

4. If the metabolic demand of the body is increased, as in thyrotoxicosis, the speed of blood flow is increased proportionately.

5. If the metabolic demand is lowered, as in myxedema, the speed of flow is decreased.

Continuing their work, they found that patients with compensated heart disease had normal levels of blood velocity in relation to their basal rates. In those with decompensated heart disease, even though the basal metabolic rate was normal, the blood velocity was low. It then followed that if many attempts to improve the circulation by rest, sedation, digitalis, diet, etc., failed, they could bring the basal requirement down to such level as the failing circulation could supply. In other words, the diseased heart might be unable to supply the blood required by a person with a normal basal rate but might be able to remain compensated if the requirement or basal metabolic rate was greatly lowered. It is known that patients with myxedema rarely have heart failure despite the lowered velocity of blood flow which might be even as low as that in cardiac failure. These same principles and conclusions apply equally well to the coronary heart disease with its anginal symptoms, inasmuch as the heart, being a muscle, requires more blood supply for itself at a higher metabolic rate than at a lower one, and, if it is not supplied, failure with pain and the whole coronary syndrome results. The original work in Boston is based on some 10 cases, although in a recent personal communication, Dr. Blumgart stated that he now has 75 such patients.

The profession, wisely, has been slow to accept a radical departure from the accepted cardiac therapeutics. It is with the idea of presenting additional data from this clinic, suggestions for extension of the idea to include other groups of cases, and detailing certain important points and dangers in the preoperative and postoperative treatment as well as in the operative technique, not emphasized before, that this report is prepared.

Following a combined study by the medical, cardiac, and surgical services at Temple University Hospital, it was decided to select a group of such patients and perform the total thyroidectomy upon them. Because of its novelty, the operation at first was reserved for those patients who could be classed as nearly hopeless. The patients selected had been treated by conservative methods for years. Prolonged bed rest, digitalization and other accepted therapy had been exhausted. Several decompensated while at rest in bed. We are certain, therefore, that results achieved can be attributed directly to the procedure and not to rest or suggestion. We are pleased to present a preliminary survey of these patients, and to report that there has been an improvement in all but two, and, to date, a negative mortality.

A total thyroidectomy is necessary to obtain results. If even a small portion of the gland remains, the relief will be only temporary. A condition approaching myxedema must be produced and Blumgart advocated lowering the basal metabolic rate to -25 or -30. We believe -20 is sufficiently low. Below -30 myxedema is apparent and thyroid therapy is often required, but, of course, easily supplied. Many people live very happily with a lowered metabolic rate and, with a definite therapeutic measure at hand, should myxedema develop, this fear should not be a detriment. The result of incomplete thyroidectomy in this type of patient is well illustrated by a patient of ours who was operated on before we were removing every

fragment of the gland. This man had been referred to the hospital with a diagnosis of advanced mitral stenosis with decompensation. A slightly elevated basal rate (+15) suggested the possibility of a so-called "masked thyroid condition," and the surgical department advised thyroidectomy. While approximately nine-tenths of a normal appearing gland was removed, a small portion was left. The symptoms were completely relieved and the decompensation disappeared, but, after eight months, he returned with all of his symptoms as before. It has been proved that subsequent operations on patients of this type fail as the residual gland cannot be identified. *X*-ray has likewise failed in these patients.

It appears that we have a hopeful outlook to offer these unfortunate cardiac invalids. The patients must be carefully selected, at least until further study has shown what results to expect. We believe other groups are amenable to this treatment. We are not convinced that syphilitic heart disease is a contraindication. One of the 4 patients in whom a complete thyroidectomy for syphilitic heart disease was performed in this series showed little if any improvement in spite of a lowered basal rate, and now has most of her original symptoms. However, subsequently, 3 patients, with multiple aortic aneurysms, have been markedly benefited. Patients with an acute rheumatic or endocardial process should of course not be considered. This applied especially to the patient with recent embolic phenomena.

In advanced arteriosclerosis where permanent calcium deposits have been fixed in the tissues, complete recovery cannot be expected. In those with impaired renal function, there is a moot question as to its value. Theoretically, close connection between the cardiac, vascular, and renal systems makes it seem that if an early case presented, before too much renal impairment had taken place, benefit from the lowered metabolism may result. No case remains purely cardiac or renal very long. We have tried the operation on but 2 patients of this type.

The first was a married woman of twenty-six years, with a markedly advanced renal lesion with secondary congestive heart failure, anasarca and the rest of the syndrome. The blood pressure was 240/160 with daily variations, and there was an urea retention in the blood stream of 55 mg. per 100 c.c. of blood and a creatinine of 3.6 mg. Believing the condition hopeless but urged by the patient and her family, a total thyroidectomy was performed, with no difficulty at the operation time. The postoperative course was somewhat stormy, with a continued hypertention and anasarca, but an improvement in the blood urea and creatinine. Eight and one-half months after the operation, the patient is alive and certainly no worse than previously, but with little improvement noted unless we can attribute the prolongation of life to the treatment. The operation here was in the purely experimental state and is reported for completeness. The condition, while very advanced at least shows how well a badly decompensated patient can stand the surgical procedure.

Another patient of this type was a Russian woman of forty-three years of age, who entered the hospital because of marked edema of the ankles, precordial pain and severe headaches of two years' duration. Her blood pressure on admission was 260/150 with some variations, and the urine revealed a trace of albumin with an occasional hyaline cast. The blood chemistry was normal. The eye grounds study showed vessels of a type approaching malignant hypertension. The basal rate was +20. The electrocardiograph showed marked arteriosclerotic coronary changes with myocardial degeneration, sclerosis of the mitral valve, hypertrophy of the right and left ventricles, enlargement of left auricle and aortic dilatation. The medical service advised against operation, but, at the request of the patient, a total thyroidectomy with removal of a normal gland was performed. The clinical improvement has been astounding to date, and, while still a little early for final impressions is at least most encouraging to us. The blood pressure is 190/120. More cases of this type are being studied and will be reported later.

The possible benefit of complete thyroidectomy in advanced tuberculosis is

being considered, and in the light of our present findings, seems plausible. The restless hyperactive state that often affects the tuberculous patient could certainly be arrested and the myxedematous tendency with slow movements, increase in weight and the desire to rest most of the time should be conducive to pulmonary healing.

SELECTION OF PATIENT

Only those in whom other therapeutic measures have failed are considered eligible at present for the operative procedure. The dangers are fully explained to them and the decision is made by the patient. The patients as indicated before, i.e., acute, etc. are eliminated, but, otherwise, no patient is refused because of the operative risk, as mentioned before. We do not eliminate the syphilitic or arteriosclerotic types.

PREOPERATIVE CARE

After admission to the hospital, a basal metabolic rate is ascertained and checked, and a careful cardiac study with fluoroscopy and several electrocardiographic series are made. Of importance is the selection of a comfortable bed in some part of the hospital where he will not be irritated by other sick patients. Absolute bed rest is decreed from the time of admission. The preparation is best done on the surgical service. The digitalization as indicated is completed and maintained and a routine "steal" preparation is begun. This "steal" is the modification of the associ-suggestion method of Crile as developed on the Babcock Thyroid Service here. No mention of operation date is made. Each morning before breakfast, the patient receives a sterile saline hypodermic injection followed in ten minutes by a small retention enema. These are given in the room by the same nurse at exactly the same hour. It is explained to the patient that he needs several days of this treatment before operation can be definitely decided upon and that we will talk to him about the operation date after these treatments have been completed. An alcohol dressing is kept on the neck. Sedatives as needed are used. Lugol solution is given routinely in doses of m.xv three times a day by mouth. The carbohydrates are forced unless there are other contraindications. On the morning of the operation, morphine is substituted for the saline hypodermic and avertin is placed in the enema in doses calculated for each patient. After the patient is asleep, he is taken at once to the operating room and the procedure begun under a light nitrous oxide or local anesthesia.

OPERATION

The procedure followed is that performed routinely by Dr. Babcock. In brief a transverse collar incision is made in the wrinkle line, through skin and platysma with separation of the ribbon muscles. Every bit of thyroid visible is removed and a careful search for a pyramidal lobe is made. The parathyroids are preserved and damage to the recurrent laryngeal nerves is avoided by careful dissection when the posterior capsule is exposed. The trachea is denuded of glandular tissue and the wound closed with interrupted silk sutures without drainage. No operation has consumed more than one hour's time and we believe this shorter operating time is of importance in the comparatively mild reaction of the patient to the procedure. We do not believe it necessary to divide the ribbon muscle or to make large or deforming skin incisions and most of our operations are performed through a 5 to 9 cm. opening. We would emphasize speed, skillful retraction, care in preservation of the parathyroids and the recurrent nerves, and the use of silk rather than catgut, thus eliminating need for drainage, in the technical side of the procedure, attention to each detail of which is necessary for ultimate success.

POSTOPERATIVE CARE

Immediate: The patient is carefully watched for dyspnea, tetany, nerve palsy

as evidenced by stridor, etc. A retention enema of saline containing glucose and Lugol solution is given slowly. The head of the bed is elevated and sand bags are placed at the side of the head to prevent undue movement. Ice caps are placed over the head and precordium and fluids are supplied as indicated by the edema of the patient. If there is undue vomiting, fluid is given in some other way. An emergency tracheotomy set is maintained at the bedside. Should there be stridor or too much mucus, a tracheotomy is performed before the emergency develops as advocated by Crile. This has happened in one patient in this group but cleared up after two days, showing that it was a traumatic injury to the nerve and not a division or ligation. Digitalis is given when indicated. Should a marked auricular fibrillation develop, this is handled by quinidine. Sedatives, usually in the form of morphine, are used as required in comparatively large doses. Special nursing care is very important.

Late: It must be emphasized that this is not a panacea. The operation, while very important, is only one step in the management of the patient. The heart lesion is still present and needs even greater diligence in its management than before the operation. Prolonged rest during the readjustment to the changed living condition must be guided. As in any cardiac condition, the elimination and diet must be directed; frequent electrocardiographs and later basal metabolic tests are indicated. The appearance of myxedema must be watched for, and, if necessary, thyroid in guarded doses administered. Tetany, if present, may be treated with calcium, and the parathormone of Collip.

RESULTS

The results have been excellent. Two of these patients who were bedfast with serious advanced myocardial involvement are now able to be up and have returned to light work. They are rehabilitated and are again useful to themselves. The change in the mental outlook of these people is remarkable. They feel so good that it is difficult to restrain them as much as is necessary.

We have now performed the operation on 19 patients, 17 of whose cases are here presented. The other 2 patients are eliminated from this discussion as they had slight enlargement of the goiter, although the symptoms were entirely cardiac and operation was a total thyroidectomy. Fifteen of the patients were females, ages ranging from twenty-one to fifty-nine years. All but 5 of the patients were of the Hebrew race, with two colored. Basal rates ranged from −6 to +32. Electrocardiographs in each case showed a myocardial degeneration. Three of the group were definite coronary disease, while 12 showed marked cardiac decompensation, primarily cardiac with two exceptions (the kidney cases already mentioned). Four were victims of syphilitic cardiac disease. All but two of the patients have shown complete relief of symptoms. The first kidney patient, as previously stated, is alive but unimproved, and one of the syphilitic patients has shown no improvement to date. One of the coronary group has an occasional attack, but we expect with continuation of the postoperative regime this can be reduced to a minimum.

DANGERS

1. Mortality during Operation. The danger of mortality during the operation does not seem as great as we would expect. While the Boston group lost 12 in 60 patients, the majority were lost in the first 20. We have been most fortunate and are not falsely misled as we know that there are certain to be some operative deaths in time. However, with minute attention to the details in the preoperative and postoperative periods and the operative technique as developed, we feel quite confident that the figure can be kept low enough to make the risk well worth while. In computing mortality figures, one must consider the losses in relation to the patients he is dealing with and the risk

in proportion to the benefits to be expected. Again, we emphasize that by careful cooperation between the services of an institution and the management under trained men who will recognize complications early, and treat them correctly, mortality per se can be kept minimal.

2. Tetany. This seems to be quite negligible if the surgeon is one skilled in goiter surgery. Nature has provided the parathyroids with an adequate protection as shown by the fact that Kocher in 48 complete thyroidectomies had only 8 tetanies. One of our patients complained of slight stiffness relieved by the use of calcium by mouth for about three days. The number (2 to 8) and position of these little glands makes their injury, while possible, at least remote. Fortunately for the work of Collip, we have a method of therapy should it be necessary.

3. Recurrent Laryngeal Nerve Injury. This is a potential danger which can be surmounted only by attention in dissection and is a matter of operative technique. In Boston, after the removal of one lobe of the gland, a laryngeal examination is performed to determine if the cord on that side is intact before proceeding. We have not found this necessary as the nerves have been recognized and injury avoided. Should injury result, a tracheotomy is indicated at once, as in our one patient who responded so well.

4. Pulmonary Complication. This is reported to be one of the more serious dangers, but, in our experience, it has not been disturbing. None of ours had any serious pulmonary complications.

5. Infection. We have had no infected wounds, not excluding the tracheotomy patient. In Boston, one death occurred from mediastinitis, resulting from opening into the thorax in dissecting back the lower incision flap. This, of course, is an accident.

6. Hemorrhage with Asphyxia. Very little has been written about this possibility and we wonder if more of the deaths in the first twenty-four hours after thyroidectomy attributed to heart failure, pulmonary collapse, and such are not in reality due to the pressure of a large clot on the trachea. The closure of the ribbon muscles and platysma of skin prevents even a bulge in the neck. We have seen this occur on three occasions after thyroidectomies. The condition can be immediately relieved by the opening of the skin and muscles and evacuation of the clot, thus relieving the pressure. No delay can be permitted and the first attendant called should perform the procedure at once, at the bedside. In one instance, one stimulant after another was ordered by a resident who did not recognize the active condition —another applied an oxygen tent and a pulmotor, while a tracheotomy was performed in a new site by a third. This possibility must be kept in mind in any sudden collapse of a patient after an operation on the neck. Curiously enough, some of these patients remain pale rather than becoming cyanotic. A trained attendant for twenty-four hours with an available forceps and scissors can eliminate this possibility.

While the group selected were diagnosed as having normal goiters we have had many other patients under similar conditions, where a small adenoma or histologically hyperplastic gland was discovered only after the operation. It is difficult to conceive of such a sensitive gland as the thyroid so closely related to the heart remaining entirely normal during a cardiac decompensation. Perhaps the goiter enlargement is secondary in some cases, at least the connection is a definite one physiologically, and this possibility should be kept in mind in studying bizarre cardiac problems.

This study suggests that in the routine thyroidectomy for goiter, more of the gland be removed. The large percentage of recurrence of the tumor following the old lobectomy emphasized how rapidly the remainder of the gland will hypertrophy. Especially where there is cardiac involvement, it is safer to chance the

occasional myxedema than the resultant cardiac disturbance from the hyperplasia of a small piece of retained gland. The continuation or recurrence of cardiac symptoms after thyroidectomy for toxic goiter is due, we believe, to this removal of insufficient gland, and not to a dysfunction of the adrenals or other internal secreting glands. Where the cardiac lesion is advanced, the surgeon should remove all of the gland that he can find, and even then the danger will be in the retention of too much tissue.

CASE REPORTS

Case 1. Mrs. P., aged fifty-two, white, housewife, Jewish, referred by Dr. J. Wolffe, entered March 15, 1934.

History: She was always well except for rheumatism during childhood until the winter of 1932–33 when she began to have what she calls "heart attacks" characterized by breathlessness, dizziness, palpitation, cyanosis, clammy perspiration and the like. She continued her house work until August when she was so weakened that she was sent to a city hospital for three weeks with some improvement. When she arrived home again the symptoms quite promptly returned. She was then sent to a convalescent home for nine weeks. Under digitalization, etc., she only slightly improved so she was brought to Temple Univerity Hospital.

Physical Examination: This revealed cyanosis, a fullness of the veins of the neck, the heart enlarged to the left and right, with the liver three fingers breadth below the costal margin. Systolic bruit as well as diastolic could be heard at the apex. The rhythm was irregular with a loud systolic bruit and a pulse deficit (heart 135—pulse 95). P_2 was accentuated and there was a poor general cardiac muscle tone. There was fluid at both bases. The blood pressure was 155/95 (variable). The fluoroscopic finding was a heart of the mitral stenotic type, with dilatation of the left auricle and enlargement of the left ventricle. The right ventricle was enlarged (5.4 cm.).

Diagnosis: Rheumatic heart disease, advanced mitral stenosis, hypertrophy of both ventricles, dilatation of the auricle, bilateral pleural effusion, passive congestion of the liver, auricular fibrillation and cardiac decompensation.

Course: While waiting for an optimal operative time, the patient suddenly decompensated and nearly died. The pulse became imperceptible and a venesection was ineffective. With morphine, stimulation, digitalis (10 ampoules digitfolin) after three hours the patient was revived. Subsequently she was kept on medical service for approximately five weeks. During this time she had attacks of common duct colic with Charcot's intermittent fever, and jaundice, which were treated conservatively. After the routine preoperative preparation, including heavy digitalization (digitalis powder gr. 11 t.i.d.) she was operated upon. The course postoperatively was somewhat concerning for forty-eight hours after which the pulse became regular and except for a period of heart block from over-digitalization she has progressed uneventfully. Intravenous glucose and free use of morphine were necessary in this case. She was allowed out of bed on the eleventh day and is now home walking and comfortable. Six months after operation she is able to sleep without sitting up for the first time in two years.

Pathology: The gland is normal in size and appearance with a long pyramidal lobe. Very little epithelial hyperplasia.

Comment: Here we see a patient who was doomed to bed rest and even under carefully supervised rest routine was subject to decompensation. She has been rehabilitated and is a most striking example. She has gained weight and feels, as she states, that a load has been removed from her. Her basal rate has been reduced at least from plus 2 to −18 although this is probably lower as she will not cooperate too well in the test. This is a striking evidence of how well a bad cardiac patient can stand the operation. As previously advocated, she will be most carefully supervised from now, as we realize that, while she is much better, the underlying cardiac pathology remains and this must be watched. The liver is now within normal limits and the chest is clear, indicating that compensation is complete. There has been no evidence of calcium deficiency and her recurrent nerves are intact.

Case 11. Mrs. Mc., aged sixty-three years, white housewife, entered Temple University Hospital with a history of sixteen years of pain

in the chest referred down left arm, of anginal type.

The physical examination showed a hypertension (220/100) and auricular fibrillation (pulse deficit 30) with a weakness of the left third nerve. The fluoroscope revealed both the left ventricle and auricle enlarged and there was evidence of aortitis. The diagnosis by the Cardiac Department was hypertensive heart disease with mitral stenosis and insufficiency. Laboratory examination revealed a basal metabolic rate of +6, negative Wassermann and Kahn reactions. The urinalysis and spinal fluid examinations were both normal.

A total thyroidectomy under the routine conditions, previously outlined, was performed without mishap. After the eighteenth postoperative day the auricular fibrillation was broken with quinidine and except for a short period of over-digitalization the course was uneventful. She was discharged to a convalescent home on the twenty-fourth day, symptom free. She has been seen on five monthly occasions and has had no recurrent angina. Pathologically the gland was normal.

Comment: Again we had a patient too ill to continue her normal life. The etiological factor in this case was a hypertensive heart disease with the anginal syndrome. The clinical improvement in this patient was miraculous. The basal rate at the time of discharge was −20 which seems, in her case, to have been ample. Realizing that this sudden gain had to be held, this patient was sent to a convalescent home for six weeks. She has been watched carefully. The last blood pressure reading was 180/90.

SUMMARY

1. The development of complete thyroidectomy for heart disease is traced.

2. Suggestions are made for the extension of the procedure to the arteriosclerotic, renal, and syphilitic groups with the presentation of case summaries.

3. A routine preoperative, operative, and postoperative regime is detailed.

4. Results in 19 patients are presented.

5. The potential dangers are emphasized.

6. A suggestion is made for more complete thyroidectomies routinely.

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THE PREVENTION OF POSTOPERATIVE EMBOLISM AND PHLEBITIS

WITH DESCRIPTION OF APPARATUS EMPLOYED

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PULMONARY embolism is always the most tragic of postoperative complications, while postoperative phlebitis is disappointing to the patient as well as prolonging hospitalization and frequently incapacitating one for months, so that any measure that will prevent or reduce their occurrence is deserving of serious consideration.

The history of both conditions extends back to the earlier surgical pathologists, particularly Virchow and Welch who for practical purposes thirty or forty years ago gave us descriptions of their genesis and symptoms which have left little to be added since that time.

Most of the recent literature has been more in the way of accumulation of data dealing with the frequency of the condition, although a few writers have approached this subject from the angle of prophylaxis. Wilson in 1912 stated that at St. Mary's Hospital the incidence of pulmonary embolism was .07 per cent. Henderson at the Mayo Clinic from 1917 to 1927 found a mortality rate of .37 per cent due to this cause. W. A. Lister from the Pathological Institute of the London Hospital states that in 4000 major surgical procedures there were 195 cases of pulmonary embolism and 172 cases of embolism due to fractures. E. C. Lindsey reports a .3 per cent surgical mortality from this cause. Miller and Rogers[8] reported 113 cases from the Massachusetts General Hospital, 1900–1927, 76 surgical and 37 non-operative.

Most literature deals with the more fatal pulmonary embolism, but the fact that postoperative phlebitis and pulmonary embolism primarily arise in the same manner, and are caused by the same influences renders advisable the study of both conditions conjointly. Any measure which will favorably influence the occurrence of one will have a like influence upon the other.

With but very little variation most of those who have studied the subject accept Aschoff's views upon the origin of embolism and thrombosis as authoritative. He holds that thrombosis is the result of a number of variables, and that there is not a single cause, but quite a number of different conditions which are closely related to the occurrence of thrombosis. Amongst these may be mentioned (1) changes in the blood plasma (diminished or increased coagulability); (2) changes in the blood elements (increased or diminished powers of agglutination); (3) changes in the blood flow (slowing and formation of eddies), and (4) changes in the vessel wall itself (endothelial damage).

Lister deduced from his investigations that impeded venous flow plus incision into the anterior abdominal wall are the principal provocative factors in postoperative thrombosis, which is another way of stating that thoracic breathing and muscular relaxation are the main causative factors.

Walters considers that a lowered metabolic rate is a decisive factor, or rather that the principal cause of the condition is a slowing up of the blood stream, and to overcome this the administration of

thyroid extract postoperatively is indicated. There is no question but that his statistics show a decisive lowering of the

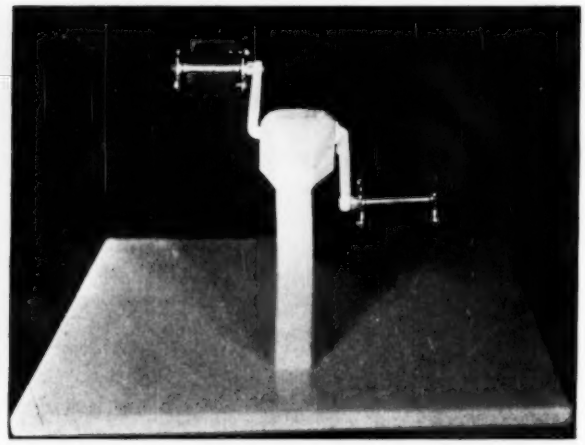

Fig. 1.

number of cases of postoperative pulmonary embolism in the 4500 consecutive cases reported.

The definite increase in the blood platelets and the increase in the coagulability of the blood postoperatively, due to the liberation of thrombokinase, plays an important part in the causation of these complications.

Rosenow has demonstrated the presence of bacteria in a large proportion of cases, and contends that this is another important factor in the development of the condition.

Experience has shown that in most fatal cases of pulmonary embolism the patients have passed the meridian of life, so age also enters as a factor. However, in postoperative phlebitis our observation has been that it occurs just as frequently in the young adult as in those in the later years of life.

Most of the factors mentioned: age, increased coagulability of the blood, and increase of the cellular elements of the blood are largely beyond our control. Gentle handling of the wound tends to diminish the formation of thrombokinase and to that extent would act as a preventive of coagulation. The main factor, however, affecting the development of postoperative phlebitis and pulmonary embolism, is the retardation of the blood stream, and this is largely under our control, and can be influenced very materially.

Physiologically the flow of blood from the lower extremities and abdomen is due principally to the negative thoracic pressure brought about during respiration and the muscular contraction and muscular tone of the muscles of the lower extremities.

As most of the postoperative pulmonary emboli, as well as most postoperative phlebitis originate either in the femoral or pelvic veins, any measures which will prevent retardation of the blood flow in the main channels should have a similar effect secondarily in all of the tributary vessels. The flow of blood through the veins is subject to the same physical laws which control the flow of all liquids with solids held in suspension, and the retardation of such fluids will normally, when brought into contact with fluids from a tributary vessel, cause the development of eddies and back currents, which in conjunction with the abnormal condition existing in the cellular elements of the blood postoperatively, favors the deposition of the solid elements of the blood resulting in the formation of a thrombus.

Pool in 1912 advocated muscular exercise as a preventive of postoperative complications, but no one has apparently attached to the subject the importance which it warrants, as is evidenced by the relatively high incidence of the occurrence of pulmonary embolism and postoperative phlebitis throughout the world.

During the past twelve months we have employed two concrete measures which in our opinion have had a very definite preventive effect upon the development of these two postoperative complications. First is the employment of carbon dioxide and oxygen postoperatively, which was originally instituted as a preventive of postoperative pneumonia, but which we have come to believe serves an equally useful purpose as a measure for preventing the occurrence of phlebitis and pulmonary embolism, by the forcing of deep respira-

tion at a period when all vital functions are at a low level. After the first twenty-four hours' employment of carbon dioxide and oxygen, routine deep breathing exercises are substituted.

Secondly, an equally if not more important measure in promoting the flow of venous blood in the lower extremities is the maintenance of the muscle tone and contraction of the muscles of the legs. This is accomplished by the systematic daily use, beginning the first day postoperatively, of a device consisting of two bicycle pedals mounted upon a broad base which can be placed conveniently in the bed for exercising the lower limbs.

A year is a short period of time upon which to base deductions, but during this time in a 100 bed hospital, where such procedures have been employed routinely there has not been a single case of either condition, whereas in a similar number in which these measures were not employed there has been one fatal case of pulmonary embolism, and 3 cases of phlebitis of the lower extremities.

A second advantage from the use of the exerciser is the maintenance of body strength. As a whole such patients when allowed out of bed remark upon the feeling of strength and well being, and the ability to walk without effort.

The principles underlying the measures advocated, for the overcoming of the retardation of the blood flow, are not new, but their application has been neglected. In enforced deep respiration, the systematic exercise of the lower extremities, and the administration of thyroid extract as advocated by Walters, we have three concrete measures which are easily administered for definitely controlling the retardation of the blood stream, and when applied systematically, markedly lower, if they do not entirely prevent, the occurrence of the postoperative complications: phlebitis and pulmonary embolism.

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BIZARRE SYMPTOMS OF HYPOTHYROIDISM

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THE symptoms of hypothyroidism are so varied that I wish to call attention to a clinical type of under-functioning thyroid gland that is frequently overlooked and rarely ever suspected. The clinical picture of a true myxedema or Gull's disease does not interest us in this discussion as the symptoms described in a classical picture of myxedema represent the terminal stage of a chronic progressive disease. In this discussion attention will be called to symptoms that are rarely ever attributed to the thyroid gland.

It is of interest to call attention to the fact that the symptoms of the type of hypothyroidism which are recorded in this paper came to my attention while studying patients suffering from peptic ulcer in the stomach clinic of the Fourth Division of Bellevue Hospital. This clinic is a refer clinic and our patients have either been operated upon for an ulcer or have had *x*-rays and a positive diagnosis made before they come under our observation. During the first five years that our clinic was run we were frequently called upon to render an opinion in reference to patients that had symptoms simulating peptic ulcer but with repeatedly negative roentgenologic examinations of the stomach and duodenum. Having been at a loss at explaining their symptoms, my attention was first called to a possible hypothyroidism in one of these cases. The patient was a graduate nurse that came under our observation in August of 1931 and this case will be reported in this paper. After meeting with success in the treatment of this patient I have had occasion to treat 43 patients for abdominal symptoms with an under-functioning thyroid gland during the past three years. It seems worth while calling attention to the fact that the gastroenterologist is the individual that will encounter this type of patient and they never get to a thyroid or endocrine clinic, as they do not have any thyroid enlargement or symptoms that would make one suspect a thyroid deficiency from casual examination or questioning.

Attention was called to this condition in a paper published in May, 1932[2] and I will at this time report one of the cases originally reported and supplement it with two others to illustrate the fact that these patients have gone from clinic to clinic, or from physician to physician without any improvement in their condition or without a correct diagnosis even being suspected.

CASE 1. A graduate nurse, female, aged twenty-eight, seen August 21, 1931, because of abdominal pain after eating, and of nausea and vomiting. Since she was about seventeen, she had been bothered with abdominal pain, nausea and vomiting which had become gradually worse. The pain came after a heavy meal and was usually worse about 11 P.M. but vomiting gave relief. Ten years before admission a roentgenologic examination of the gastrointestinal tract was made in the Boston City Hospital, and the result was pronounced negative. In spite of medications and a careful diet, her symptoms had become worse, and since May of this year she has had persistent discomfort. In August of 1931 she had two roentgenologic examinations of the gastrointestinal tract at Bellevue Hospital which were pronounced negative, but because of the history she was referred to us for an ulcer. On being questioned the patient complained of

extreme lassitude in the morning, dry skin, brittle nails, loss of hair, skin chapping easily and mental depression and irritability. A hypothyroidism was suspected, and the metabolic determination, done August 29, revealed a rate of minus 18. Physical examination revealed a dry skin, epigastric tenderness, pulse 64, and blood pressure 98 systolic and 70 diastolic. The patient was put on thyroxine, 1/6 grain (1 mg.) intravenously, every seven days, and thyroid extract 1/2 grain (32 mg.) three times a day. Her symptoms disappeared after six months' treatment. In November, 1932 she was operated upon for a fibromyomata of the uterus from which she had an uneventful convalescence. For the past year and a half she had been attending her mother who was confined to bed with a cerebral hemorrhage and during this period I seldom saw her as she lived in Boston. She has now returned to New York since the death of her mother six weeks ago and her basal metabolism on August 16, 1934, was minus 15 and cholesterol 198.5. Her only complaint was lassitude and there were no symptoms referable to her stomach and have not been since January, 1932. At this time she is again being treated with thyroxine and thyroid extract as formerly.

Case II. Male, forty-six years of age, seen first in March of 1933. This patient was an engineer at Bellevue Hospital and had been under the care of numerous physicians before being referred to our clinic. The patient stated that six or seven years ago he first began with a pain in the left side of his abdomen which was dull in character and when it was first noticed took bicarbonate of soda without any relief. After several months or a year he began having pain in the right side of the abdomen which was more severe. He was under the care of a family physician at that time and he was given different medications without any improvement. Approximately two years after the onset of his symptoms his physician had a roentgenological examination of the gastrointestinal tract which was reported negative but in spite of this we gave him an ulcer diet and a medicine for his nerves. He received no benefit from this treatment and six months later the pains were getting more severe and he was definitely worse. Three years before consulting our clinic or in 1930 he was examined in the admitting office of Bellevue Hospital and had a gastrointestinal series, gall bladder, and kidney *x*-rays, all of which were reported negative. At that time he was given a Sippy diet and belladonna to take and also was advised that he needed a vacation and to stop the use of alcohol, but the patient had never used alcohol in his life and had just had a month's vacation at that time. After continuing under the Sippy diet and belladonna for about a year without improvement in his symptoms he was admitted to the hospital in October, 1931. At the time he was under observation for two weeks and had *x*-rays of his gall bladder, stomach, kidneys and a barium enema, all of which were negative. A cystoscopic examination with pyelograms was done and reported negative. He was again put on a Sippy diet and continued on this regime through the remainder of 1931 and 1932 without any improvement in his symptoms. Just before consulting our clinic in March, 1933 he had the gastrointestinal *x*-ray series repeated, which was reported negative. At that time he was complaining of abdominal discomfort which would come on after meals and was not relieved by the taking of food and the symptoms were the same as he had had over a period of six years. Examination of this patient was entirely negative and a basal metabolism was suggested. The report on the metabolism was a minus 8; although the metabolism was in the low limits of normal, I felt that this patient's symptoms were probably due to his minus metabolism. He was then put on thyroxine intravenously, thyroid grains 1, t.i.d. He was told at that time that he need not expect any improvement for at least one to two months and not to get discouraged. Approximately three months from the time of his first visit he was definitely better. At the time of his first visit he was given a fourth week Sippy diet and six months after he first consulted me he was entirely symptom-free. It has now been eighteen months since we first saw this patient and for the past twelve months he has been well and has no symptoms whatsoever and is working regularly but continues to take one ampule of thyroxine every week and thyroid grain 1, t.i.d. His metabolism has been checked four times since under our observation and they have all remained between a minus 8 and a plus 8. For the past six months this patient has eaten anything and everything he wants and does not have any symptoms following heavy food.

Case III. Female, thirty-nine years of age, seen first December 4, 1933, complaining of abdominal pain and bleeding from rectum.

Past history: The patient had been operated upon five years before for a lacerated cervix and laceration of her peritoneum and suspension of uterus; otherwise no serious illnesses except an appendectomy at the age of seventeen. She was married at twenty-five and has three children, the oldest thirteen and the youngest six.

Present illness: She states that since she was sixteen or seventeen years of age she has had abdominal pain and was told she had chronic appendicitis and had an appendectomy without relief of her abdominal symptoms. Her abdominal pain has been of the similar type since it was first noticed twenty-one or twenty-two years ago but it has gotten gradually worse with her pregnancies. She has gotten very tired for the past few years and it seems to make her abdominal discomfort much worse. Since her operation five years ago she has had two spontaneous miscarriages although she is very anxious to have more children and was very careful during the pregnancies. She has found that she needs nine to ten hours sleep at night and complains of very dry skin, dislikes the cold weather intensely and her lassitude has gotten progressively worse. Ten years ago she was under the care of a prominent Philadelphia gastroenterologist and at that time *x*-rays were taken on her stomach, gall bladder and a colon enema which were pronounced negative. She has also been under the care of a New York physician and the *x*-ray studies repeated all of which were negative. In spite of her dietary regime, rest and medication her symptoms have gotten worse and for the past two or three years she has been bothered with a little bright red blood in her stools although she is not constipated and has never noticed any hemorrhoids. Examination revealed a slight epigastric tenderness, but no gall-bladder tenderness, no abdominal masses and vaginal examination was negative. Proctoscope examination revealed a small mucous erosion just inside the rectum which was cauterized with Cornoy's solution and there was no evidence of hemorrhoids. Her blood pressure was $^{120}/_{70}$ and her pulse 70. From the history a diagnosis of hypothyroidism was made and a basal metabolism ordered which was done December 6, 1933, and was a minus 25. Her blood count at that time was 4,600,000 88 per cent hemoglobin (Sahli). Her white cells were 5300, 56 per cent polymorphonuclears. Urinalysis was negative except for positive indican reaction. The patient was informed that she could probably be benefited by thyroxine and thyroid medication and was advised to take one ampule of thyroxine every five days and thyroid grain 1, t.i.d. by mouth. She was started on the medication and sent to her home in Pennsylvania and this medication was carried out by her own physician. She was reexamined on January 16, 1934, and the patient stated that she felt greatly improved and had very slight abdominal pain. Her severe lassitude was greatly improved, and there was no bleeding from the rectum and her basal metabolism at that time was 0. She was advised to discontinue the thyroxine but continue taking thyroid grain 1, t.i.d. for a period of six weeks. She was next seen August 10, 1934, at which time she stated that she had felt well until about one month previously, but since then had been getting tired. She had no abdominal pain or bleeding from the rectum and the basal metabolism determination by her own physician was a minus 17 on July 7, 1934. At the time of this visit the patient was four weeks pregnant and was given one ampule of thyroxine and advised to take one ampule intravenously every week for the next six weeks and thyroid grain 1, t.i.d. Her basal metabolism is to be repeated at the end of that time and the medication administrated according to her symptoms and metabolic findings. It was felt that if her basal metabolism was kept normal that she would have an uninterrupted pregnancy.

In evaluating the bizarre symptoms of hypothyroidism it is essential to differentiate between those patients that are suffering from a true thyroid disturbance and a group of patients that have a definite peptic ulcer with negative roentgenologic findings. The symptoms of hypothyroidism are lassitude, more marked on arising in the morning, improving during the middle of the day and returning in late afternoon or evening. The abdominal symptoms are frequently associated with the period of lassitude. A dislike for cold weather, dry skin, dryness of the scalp, brittle nails, scanty menstrual flow and the absolute

necessity of nine to ten hours' rest at night, also mental depression and irritability associated with the period of lassitude. The pain of the hypothyroid patient may be fairly typical of a peptic ulcer patient but the periodicity of the ulcer patient is lacking in the patient with hypothyroidism unless there is a long vacation with complete rest when the symptoms will frequently improve; under the ordinary stress and strain of daily activity there is rarely any periodicity in the abdominal symptoms of a hypothyroid nature. Vomiting is occasionally encountered in patients that have an under-active thyroid. This is seen when the patient is extremely tired. On the other hand there is a definite group of patients that have peptic ulcer in whom the ulcer cannot be demonstrated by roentgenologic examination. These patients give a typical ulcer symptomatology with periodicity perhaps extending over years with the intervals of freedom from pain becoming shorter and the severity of the pain gradually increasing. This type of patient has definite relief from a Sippy regime where the hypothyroid patient rarely gets any definite improvement from the ulcer diet. I do not wish to leave the impression that all patients that are suffering from ulcer symptomatology with negative *x*-ray findings have a definite hypothyroidism. Some of these patients do, and if one is careful to evaluate the symptoms of hypothyroidism these cases can be diagnosed and a basal metabolism will verify the diagnosis and they will respond to the proper treatment.

The laboratory aids in making a diagnosis of hypothyroidism are of little value other than a basal metabolism and a cholesterol determination of the blood. The basal metabolism and the cholesterol studies show a reciprocal relationship in thyroid disease. From a recent editorial[1] a hypercholesterolemia is emphasized as being of more significance than a low metabolism in hypothyroidism. It is important to do the cholesterol determination in conjunction with the basal metabolism. In the borderline patients with a questionable hypothyroidism with the metabolism around a minus 8 to 10 the cholesterol determination will frequently be in the upper limits of normal or just above, which is of definite help in establishing the fact that the thyroid is under-active. A gastric analysis is of no practical significance because the variation is so very great and one can attach no significance to a hypoacidity or a hyperacidity. There is no general disturbance in the motility of the gastrointestinal tract as determined by the gastrointestinal *x*-ray examination.

The treatment of these patients should consist of thyroxine (1 mg.) intravenously once a week, with thyroid extract, grain 1, orally b.i.d. to t.i.d. It is important to continue the thyroxine administration intravenously at weekly intervals over a relatively long period of time varying from eight to fifteen weeks, governed by the clinical course of the patient. It is rare that any improvement is noticed in the symptomatology under four to six weeks and it is well to inform the patient that he will probably not have any benefit under a six week period. Of course the treatment of these patients has to be carried out for a long time, that is, their metabolism should be checked at least twice a year and their thyroid and thyroxine administration governed according to their clinical course and their metabolic findings. After a patient is symptom-free and metabolic determination normal they should be informed that this state will not continue unless thyroid medication is taken at intervals over a period of months and perhaps years. Dietary regulations are not necessary in these patients and other medications such as sedatives are rarely administrated. The improvement is due to a general stimulation of the metabolic processes of the patient. In a few patients that have not tolerated thyroid due to nervous symptoms they have been placed on small doses (2 mg.) of dinitrophenol (O.D.) with very satisfactory results. Of course the ad-

ministration of dinitrophenol, as the literature indicates,[3-5] must be carried out with extreme caution and weekly urine analysis with the Derrien test should be done.

SUMMARY

The diagnosis of hypothyroidism producing abdominal symptoms should be made from the history and a physical examination. This is then confirmed by metabolic and cholesterol determinations. It is essential to bear in mind that all patients complaining of vague abdominal discomfort of a chronic nature in which no other cause can be found should be suspected of having hypothyroidism. If one becomes conscious of the bizarre symptoms of an under-secreting thyroid it is surprising what a high percentage of cases can be diagnosed and the patient symptomatically relieved by the administration of thyroxine and thyroid medication. Of course the diagnosis should always be confirmed by laboratory studies before this treatment is considered.

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BILATERAL CYSTS OF THE KIDNEY*

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SOLITARY cysts of the kidney occur very infrequently and bilateral solitary cysts are rare. By solitary cyst we recognize only the large, serous or hemorrhagic tumor including in its fibrous capsule a collection of clear yellow serous fluid or blood. However, either type may be multilocular.

FREQUENCY

The relative rarity of this type of kidney lesion may be seen by the findings of the following extremely qualified authors. McKim and Smith[1] in 1924 collected 120 cases from the literature. Harpster[2] in 1924 collected 95 cases. Dodza[3] in 1927 reported 70 cases. Hepler[4] in 1931 collected 249 cases from all the literature. Young[5] states that "there has not been one case of solitary cyst of the kidney discovered among the 12,500 cases at the Brady Institute."

PATHOLOGY

The cyst is enclosed in a fibrous capsule lined with kidney parenchyma and is filled with clear, yellow, serous fluid resembling the fluid of a hydrocele, or blood. The cyst may be multilocular. The cyst does not usually communicate with the renal pelvis, although there is a type of cyst that does. At times the cyst becomes malignant (papillary type of carcinoma).

ETIOLOGY

A. *Congenital Theory.* 1. Latteri[6] produced solitary cysts by implanting fragments of the ureter or renal pelvis in the kidney parenchyma. He concluded that renal cysts were congenital in origin and developed from fragments of the ureter or renal pelvis which were displaced into the kidney cortex during the process of embryological development.

2. Carson[7] states: (a) Solitary cysts are due to embryonal rests. (b) They are due to failure of union between the glomeruli and the connecting tubules. (c) They are retention cysts due to blocking of the tubules by fibrous tissue or blocking of the glomerlar tubules by desquamated or degenerated cells with continuous secretion of urine.

B. *Acquired Theory.* 1. Hepler's theory[8] is that of tubule obstruction and anemia and is based on the artificial production of solitary, serous cysts of the kidney in the rabbit by fulgurating the kidney papilla and ligating the artery supplying the pyramid.

2. Carson states: "The average age incidence is forty-five years, a period when vascular lesions such as arteriosclerosis, endarteritis, aneurysms, infarcts, and other acquired lesions, such as tumors, are common.

AGE AND SEX

The average age incidence is forty-five years. Taylor[9] reported a case in an infant nine months old. Women seem to be affected about twice as often as men.

LOCATION

Usually the upper or lower pole; less frequently the central portion of the kidney.

DIAGNOSIS

1. *Symptomotology:* There are *no* characteristic symptoms. Frequently the condi-

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tion is discovered accidently while investigating an associated kidney condition, e.g. renal calculus. In the 3 cases of solitary

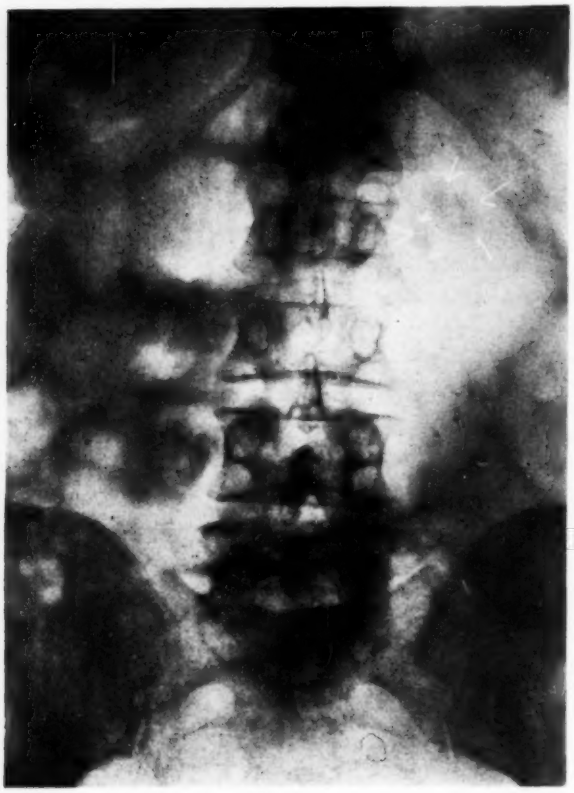

Fig. 1.

cysts of the kidney reported by Stevens,[10] by Herbst and Vynalek[11] and by the author, the immediate condition that brought the patient to the doctor was a renal calculus. Pressure symptoms may be present if the cyst is sufficiently large, or in the presence of malignancy.

2. *Pyelography*. There is *no* characteristic pyelogram indicating the presence of solitary cyst of the kidney. The pyelograms are usually normal. The calices may be compressed as in malignant renal tumor. Kirwin reports a case of calcified renal cyst which was vizualized with *x*-ray.[12] Herbst and Vynalek place emphasis on the outline of the shadow of the cyst itself or of calcification: "A most important and frequent finding is the outline of the shadow of the cyst itself in close approximation to the solid renal shadow and with density in marked contrast to that organ." As a matter of fact, on the *x*-ray plates taken in our own case the cyst of the left kidney did present a calcified shadow above the shadow of the renal calculus, nor were we able to

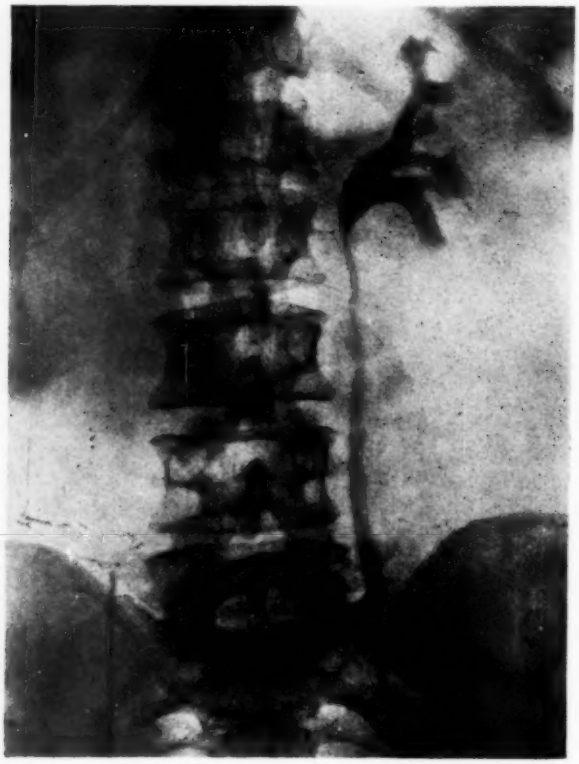

Fig. 2.

explain this shadow until operation on the left kidney, when the cyst was accidently discovered. Further, in reviewing the pyelograms after the second operation (removal of cyst of the right kidney) we were fairly convinced that the outline of the cyst could be defined.

Actually, the *x*-rays, both retrograde and intravenous, showed a *normal* left pyelogram, but a very bizarre pyelogram of the right kidney (Fig. 1). This will be discussed in the case report.

TREATMENT

1. The treatment of choice is excision of the cyst and repair of the kidney with mattress sutures, reinforced with fat pads or Lowsley catgut bands.

2. Quoting, Greenberg, Brodny, and Robins:[13] "We remove as much as possible of that part of the cyst which protrudes beyond the surface of the kidney. A running hemostatic suture is placed in the kidney tissue along with the cut edges of

the cyst. The sponge is removed in from seven to nine days post-operative. The results we have obtained were excellent.

Fig. 3.

There has been neither sinus formation nor recurrence of the cyst."

CASE REPORT

On Nov. 8, 1933, Mrs. A. M., an obese Italian woman, fifty-two years of age, was admitted to Dr. Louis René Kaufman's Urologic Service from the Emergency Ward. Her chief complaint was sudden onset of severe pain referred to the left upper quadrant. The pain was severe, localized, of twelve hour's duration, and was accompanied by nausea and vomiting. T. 103.2°F., P. 100, R. 24, blood pressure 160/80. She had experienced two previous attacks, similar in nature during the last seven years, and at one time, four years previously, had had a right-sided attack of upper quadrant pain which resulted in the passage of a small calculus.

Urinanalysis: Urine cloudy, alkaline, finely granular casts, triple phosphate crystals, 20 W.B.C. per high power field, 1 R.B.C. per high power field bacteria. The Wassermann reaction was 3+.

On November 9, 1933, *x*-ray (K.U.B.) showed "a pea-sized opaque shadow present on the left side level with the transverse process of the second lumbar vertebra. This appears to be due to a calculus in the upper end of the left

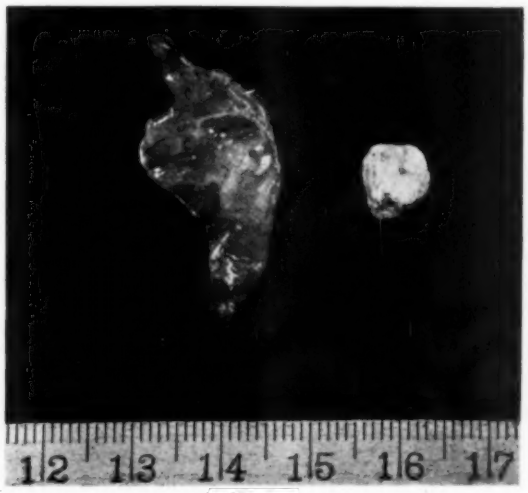

Fig. 4.

ureter. A larger opaque shadow is present above this area which changes position on the different plates." (Fig. 1.)

On November 11, 1933, examination of the genitourinary tract was made. Cystoscopic examination of the bladder revealed a generalized duskiness of the mucosa with increase in size and number of blood vessels. A few large flakes of exudate appeared in the distending medium. The right ureteral orifice which was found with difficulty, was injected and edematous. Both ureters were catheterized without obstruction. A flat *x*-ray plate showed an enlarged right kidney and a normal sized left kidney. A pyelogram showed the left kidney normal in size and contour and the shadow previously reported proved to be a calculus contained within the left kidney pelvis. (Fig. 2.) The pyelogram of the right kidney showed "a blunted, stubby incompletely visualized pelvis. The ureter is somewhat dilated at the middle third. This appearance suggests the possibility of a double pelvis on the right side." (Fig. 3.) Separate examination of urines showed equal urea output. The kidney function (indigo carmine) was good on both sides. Urine from the right kidney showed many phosphate crystals, very many pus cells, and bacteria. Urine from the left kidney showed an occasional cast, very many pus cells, but no bacteria.

On November 15, 1933 intravenous pyelograms were taken, using 20 c.c. of neo-iopax. The resultant pyelograms were identical with the retrograde pyelograms.

Interpretation of the pyelograms aroused considerable interest among the members of the urologic staff. The common opinion was that the smaller shadow on the left side was a calculus of the left kidney pelvis. But what was the larger shadow? Study of the *right* pyelogram resulted in the following opinions:

1. Reduplication of pelvis and ureter with only one segment visualized. 2. Small, atrophic kidney probably due to a long-standing pyelonephritis. 3. Tumor. 4. Syphilis (the Wassermann reaction was 3 plus).

After much thought and discussion it was decided to curb our curiosity regarding the character of the lesion of the right kidney, and operate on the left kidney for the immediate pathology, namely calculus of the pelvis.

On November 20, 1933, under general anesthesia, the left kidney was delivered through a left lumbar incision. A stone was palpated in the left kidney pelvis and removed through a posterior pyelotomy incision. During the operation the upper pole was accidently decapsulated, bringing into view a fairly shallow, solitary cyst about the size of a silver dollar. The cyst was excised. (Fig. 4.) When photographed postoperatively the cyst was shrunken. Incidentally, the presence of this cyst explained the larger shadow above the left renal calculus shadow seen on the flat *x*-ray plate.

The patient made an uneventful recovery and was discharged December 20, 1933, about six weeks after admission. A flat *x*-ray plate taken just before the patient left the hospital showed the absence of both shadows seen on the left side before operation.

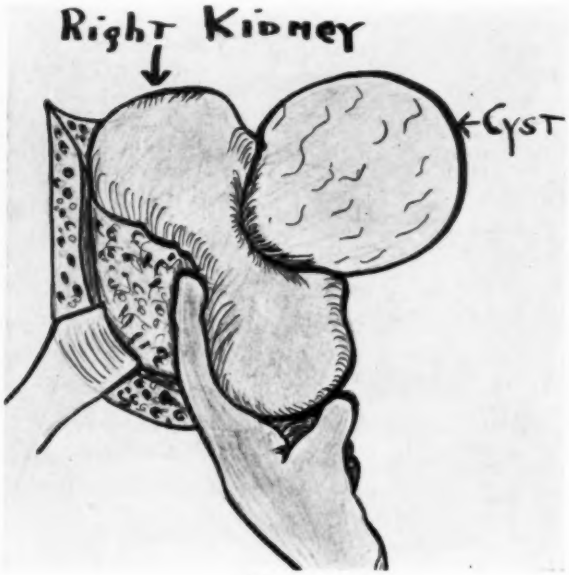

Fig. 5.

Second Operation: In April, 1934, under general anesthesia, the right kidney was delivered through a right lumbar incision. A large, solitary, serous cyst about the size of a small grapefruit was seen occupying the middle portion of the kidney. The fluid content resembled the clear, yellow fluid of a hydrocoele. (Fig. 5.) The cyst was excised and found not to communicate with the kidney pelvis. The dead space was closed with interrupted chromic o sutures, then the edges of the kidney wound approximated with mattress sutures using chromic o, reinforced by fat pads.

Fig 6.

The patient made an uneventful recovery.

Three weeks later intravenous pyelography revealed normal pyelograms of both right and left kidneys. (Fig. 6.)

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DUODENAL FISTULA DUE TO PERINEPHRITIC ABSCESS AND FOLLOWING NEPHRECTOMY*

CASE REPORT AND REVIEW OF THE LITERATURE

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IN what we believe to be a complete review of the medical literature of the world, we have found 26 cases of duodenal fistula following the operation of nephrectomy. In 1918, Edwin G. Davis[7] reported a case of duodenal fistula due to perinephritic abscess and in many respects similar to the one we are presenting. Apparently these 2 cases of duodenal fistula due to perinephritic abscess are unique as there are no other similar cases in the literature. Terebinsky[42] has reported a case of pyeloduodenal fistula and this one was also due to a suppurative calculous pyonephrosis. It is interesting to observe that in Davis' case, the duodenal fistula followed nephrectomy in spite of the fact that the fistulous tract had been sutured. In our case, a pyleocutaneous fistula was present before the operation, the perinephritic abscess apparently having eroded into the duodenum so that there was a tiny fistulous tract communicating with the perinephritic space and through the kidney pelvis to the necrotic kidney and thus to the outside by an already existing sinus.

Since there has apparently not been assembled as yet a complete series of the cases of duodenal fistula following nephrectomy, we have attempted such a tabulation believing it to be of interest to the general surgeon as well as to the urologist. Although no statistics exist which give an idea of the frequency with which these fistulae follow nephrectomy, they must be more common than their appearance in the literature would indicate. The failure to report such fistulae may be attributed to the unsatisfactory results which have thus far predominated in their treatment. Aside from the case mentioned as reported by Davis and 4 reported in 1914 and 1915 by W. J. Mayo,[27,28] we have been unable to find similar case reports in the American literature. There are 4 unreported cases; two by C. J. Miller,[31] an incomplete case report from Montague Boyd,[3] and another by W. M. Kearns.[19] Colp[6] (19[illegible]) in his collective review of 61 rep[illegible] cases (including 8 of his own) c[illegible]ernal duodenal fistulae reports 10 as following nephrectomy. Cameron (also 1923) in his series of 28 cases from the literature, includes 7 cases as following nephrectomy. Kittleson[20] collected 96 cases in 1933 and found only 11 cases following nephrectomy. This would seem to indicate that nephrectomy may be a not uncommon exciting factor in external duodenal fistula (26 out of a little over 100 reported cases from all causes or about 25 per cent). Injury to the third portion of the duodenum may occur at nephrectomy. W. J. Mayo believes that this accident is often the result of attempts to ligate the kidney pedicle, especially when the pedicle is infiltrated with inflammatory exudate which causes close adhesions to the duodenum. The inflammatory infiltration about the pelvis is most often caused by infection or by carcinomatous infiltration which brings about a shortening of the pedicle. This inflammatory reaction was present in

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the cases of Mayo,[27] Lepoutre et Dupas,[24] Michou,[30] Legueu,[23] Davis,[7] Esau,[11] Pignatti,[37] and Von Cackovic.[44] In efforts to check hemorrhage while applying the clamp to the pedicle, the trauma is inflicted. Such was the event in 3 of the 4 cases reported by Mayo. He advised against the use of forceps in controlling hemorrhage because the fingers are a more accurate and sure means of hemostasis. After the hemorrhage is under control with the fingers, forceps may be applied and the vessels ligated.

In the fourth of Mayo's cases, the formation of the fistula was probably due to a chronic infectious process. During the operation, the manipulation caused the separation of a necrotic area in the duodenum, opening the way for the fistula.

In our case and in that of Davis, as already mentioned, the cause was infection. Unfortunately, most of the cases collected for this article attribute the fistula to no specific cause.

The diagnosis of duodenal fistula usually offers no difficulties. The appearance of the gastric and duodenal secretions through the fistula can be detected by their odor and their erosive digestive action upon the adjacent tissue. The secretion may be profuse or scanty, according to the size of the fistula and the amount of food and fluid intake. Bile may or may not be present, though frequently it is seen. Usually the skin and fistulous tract become red and edematous as soon as the secretion appears. In some cases, there is a marked reaction produced by the secretion, with hemorrhage from the fistulous tract, the skin around the opening being inflamed and eroded.

The interval between the operative procedure and the appearance of the fistula varies considerably. In some of the reported cases, it appeared within twenty-four hours while in others it appeared several months later. As seen by the chart, it appears in most cases within ten days. In Rigby's[40] case, the interval was sixty-two days and in Legueu's[23] cases, nine months. The average, however, is three to ten days, postoperative, the injured region becoming necrotic and the fistula forming.

In 1926, Walters[47] and his associates reported the blood changes following duodenal fistulae. These changes are increased alkalosis, decreased concentration of chlorides in the blood serum and in the terminal stages accumulation of urea in the blood and a progressive decrease in the volume of urine and its constituents; urea and chlorides. Walters found that the intervenous injection daily of 500 to 700 c.c. of a 1 per cent solution of sodium chloride would maintain life in dogs with duodenal fistulae for more than three weeks, at which time these animals were in fair condition. The control dogs, not having received such injections, died within three to four days. These chemical changes in the blood are similar to those reported by Haden and Orr,[15] Brown, Eusterman, Hartman, and Rowntree[2] as observed in cases of upper intestinal obstruction. Walters explains these chemical changes in the blood as being the result of an attempt to neutralize toxins until normal motility of the duodenum returns. He believes that the attempt is successful as evidenced by his experiments on dogs. The response to intravenous injections of sodium chloride, glucose and water is the same as that obtained in cases of high intestinal obstruction. These experiments of Walters tend to show that fluid balance plays some rôle in the toxemia accompanying duodenal fistula.

The prognosis is always grave. Certain factors are to be considered such as the condition of the patient, the size of the fistula, and the amount of secretion escaping. Pannett[33] says that, "As far as can be ascertained from the writings of the last ten years, a duodenal fistula never heals without surgical aid, and if left, is invariably fatal." This statement was made in 1914, since which time medical treatment has been successful in several reported cases.

Palmer[32] has said that "duodenal fistulae are neither the rare nor the simple, benign affairs that the silence of the professional man might lead one to conclude." In a series of 28 cases, Cameron found the mortality to be approximately 43 per cent. In speaking of this lesion, W. J. Mayo says:

> This is a most distressing type which results often, if not usually, in the death of the patient. Ordinarily, spontaneous healing does not occur in duodenal fistulae. The rule is that the condition becomes progressively worse and ends fatally unless treated. The progress of the condition is rapidly fatal in those cases in which practically the entire duodenal contents escape by way of the fistula. The enormous interference with metabolism, together with the local destructive process, may result in death in two or three days.

Quoting from Colp[6] we find that, "If they are to be handled with any degree of success, they must be treated energetically and early, and not when the strength of the patient has been so debilitated by inanition and dehydration that surgical intervention is impossible."

Regardless of the size of the fistula, the loss of intestinal juices with the accompanying alkalosis, the loss of food and fluids will soon bring about inanition and dehydration.

TREATMENT

The treatment of duodenal fistula is (a) conservative or medical, and (b) surgical.

The conservative or medical treatment applies to those cases in which the fistula is very small and the general condition of the patient has not been as yet seriously affected. Such treatments vary considerably, all having as their basic principle the reduction of the amount of gastric and duodenal secretion and their neutralization as well as the protection of the skin and fistulous tract.

Johanson[17] reports a case successfully treated with 1 per cent citric acid introduced into the fistulous tract (2 to 3 ounces administered three or four times daily). The fistula healed in ten days. He also reports another case treated in the same manner which did not heal until several months later. Cameron[4] reports one case successfully treated by suction, Lahey[22] 2 cases, Gaminara,[14] and Erdman,[10] one each. Potter[38] reports a case treated successfully with one-tenth normal hydrochloric acid solution to neutralize alkalinity and a beef juice and olive oil preparation, both to be applied to the wound. In his case as well as in one of Lick's[25] suction failed. Kittleson[20] in 1933 treated 2 cases successfully with a new buffer solution consisting of whole milk thickened by the addition of bacillus acidophilus.

The operative procedures most commonly used are: Suture of the fistula, suture of the fistula plus gastroenterostomy, with or without pyloric occlusion, and jejunostomy. W. J. Mayo,[27] in his report of 4 cases following nephrectomy, advises us not to expect the fistula to close but to open the abdominal cavity, incise the peritoneum, and close the duodenal opening by suture before the patient is too exhausted. He believes with Kanavel[18] that the transperitoneal route is the best operation. He advises jejunostomy for temporary feeding. There is no doubt that this is the best procedure to follow in newly formed fistulae, where the edges of the fistula are still healthy and the sutures will hold, but in chronic cases most authors believe such action to be futile. Berg[1] advises gastroenterostomy plus pyloric occlusion and presents 2 cases, in one of which he had partial success. Gastroenterostomy without pyloric occlusion has been universally unsuccessful because as long as the pylorus is patent, the gastric contents will come through. Cameron[4] states that the jejunostomy is a much simpler procedure than gastroenterostomy and does not imperil the life of the patient as much, either because of its extent or the danger of peritonitis. It accomplishes a great deal, spontaneous

closure of the fistula occuring in favorable cases.

In Colp's[6] 61 cases, the mortality following gastroenterostomy with pyloric occlusion was 84 per cent, while following jejunostomy, it was 50 per cent.

FIG. 1. Original roentgenogram showing large calculus in right kidney for which a nephrolithotomy was performed.

After reviewing all the various treatments, we believe that the following are the best:

Conservative or medical treatment for cases in which the fistula is small, the amount of the secretion slight, and the general condition of the patient in a measure unaltered. This is particularly true in the transperitoneal cases not due to or following nephrectomy. This conservative treatment should consist of the limitation of fluids by mouth, intravenous injections of sodium chloride and glucose solution as advocated by Walters[47] and the protection of the skin and fistulous tract by dilution of the secretion and application of N/10 HCl, beef juice, and olive oil as advocated by Potter,[38] or the buffer solution of Kittleson, together with frequent change of dressings. The Rehfuss tube we found to be of considerable service and thought at one time that it had saved the day.

If all the foregoing means show no signs of success, surgery must be resorted to before the patient begins to fail.

When the fistulous tract is obviously large, the amount of secretion profuse, and the health of the patient rapidly declining, the surgical treatment becomes immediately imperative. The fistula must be closed and jejunostomy performed as suggested by Mayo. There is no doubt that the high mortality associated with such operative procedures is due to hesitation upon the part of the surgeon, which permits the condition of the patient to become such that no operation could be of any avail. When the patient's condition promises little, only a jejunostomy should be performed. In all cases, the blood chemistry warrants observation and the treatment as suggested by Walters should be instituted.

CASE REPORT

The patient was a white woman, aged thirty-six. The history of the case extends over a five year period. She first consulted a physician for bladder trouble, consisting of constant burning and frequency on urination and attacks of pain in her right upper quadrant. An *x*-ray of the urinary tract showed the presence of two large calcareous masses in the right kidney area. In view of this and the persistent pyuria, the diagnosis of right nephrolithiasis was made and nephrectomy advised. This she refused to have done and after consulting several surgeons, she found one who promised to save her kidney and who performed a nephrotomy and removed the stones. The postoperative recovery was uneventful and she left the hospital in four weeks. A pyelocutaneous fistula formed and persisted, the patient being forced to wear a pad to collect the urine which escaped from this fistula. She was first seen by one of us five months later, at which time the fistula was found to be still draining. On cystoscopy, a stricture was met at the ureteropelvic junction as shown in the

ureterogram (Fig. 2). Several attempts were made to pass a fine filiform through this stricture but only on one occasion was success

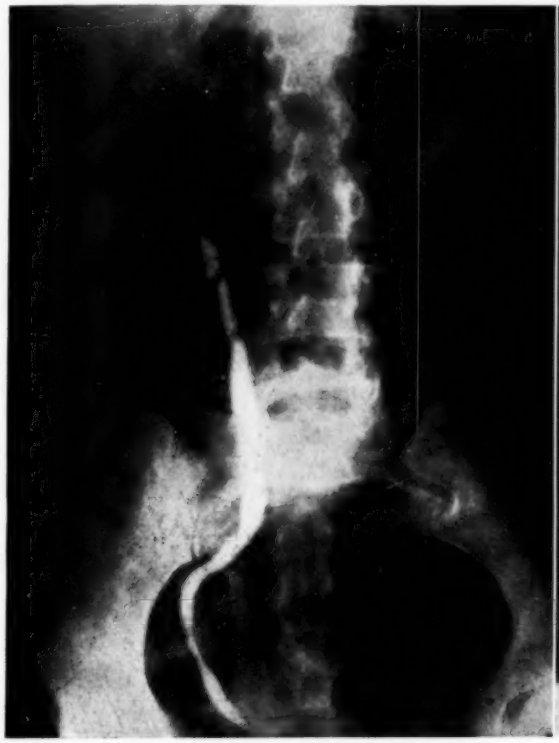

Fig. 2. Ureterogram showing very fine filiform stricture at ureteropelvic junction. Plate made several months after nephrolithotomy.

Fig. 3. Roentgenogram showing lipiodal filling of fistulous tract. Lower mass represents kidney pelvis of pyonephrotic kidney, upper mass with connecting sinus represents lipiodol in duodenum and fistula connecting duodenum and kidney.

met with. At this time, urine flowed through the ureteral catheter. That there was an intermittent drainage down through the stricture was evidenced by the fact that the fistula would close for a few weeks at a time. She was seen at intervals over a period of five years and we urged her to consider nephrectomy but this she refused to do. Shortly after this one of us was called to see her at her home at which time she was quite ill. The fistula had reopened and thick pus was exuding. Her temperature was 104°F., pulse rapid and bounding, frequent chills, and pain over her right loin. She was sent to the hospital and there it was found that gas bubbles were escaping through the fistula. A cystoscopy was not performed because the patient was too ill, and also because it was not necessary since we already knew that the other kidney was functioning normally. The fistula was filled with lipiodol and an *x*-ray plate was taken which showed the peculiar shadows seen in Figure 3. The interpretation was pyelocutaneous fistulous tract and also a fistulous tract passing upward to another cavity in front of the upper pole of a very large kidney. The clinical findings plus the absence of psoas shadow in the radiogram confirmed the diagnosis of a perinephritic abscess together with a pyonephrosis. At that time a pyeloduodenal communication was not suspected. A nephrectomy was decided upon and performed. The curved lumbar incision was made and a perinephritic abscess as well as a very large pyonephrosis in a lake of pus was found. The kidney was freed from its dense adhesions, since it was apparent that if a two stage operation were attempted the kidney never could be mobilized a second time. The ureter was found, freed and severed and the pedicle was clamped under vision with three clamp technique. The pedicle was ligated satisfactorily. There was no tear or trauma of the peritoneum, no slipping of the clamp or ligatures. The wound was closed in layers and three large drains were left in place. The patient came out of the anesthetic and was not in shock. She was apparently doing well when twenty-four hours postoperative,

there was seen what was first thought to be fecal drainage. On close examination, this was found to be duodenal drainage. Suction was immediately instituted to take care of the leakage. The wound was partially reopened, the drainage tubes removed and long strips of uterine packing gauze soaked in N/10 hydrochloric acid and beef juice were introduced into the wound down to the duodenal fistula in an endeavor to protect the raw walls of the enormous wound from the eroding action of the duodenal juice. As everything taken orally came out through the wound, feeding by mouth was discontinued. Infusions of physiologic salt solution, 3000 to 5000 c.c., were given daily besides 50 to 100 gm. of glucose. She had such severe reactions from the glucose that it had to be discontinued. A Rehfuss tube was then passed by mouth beyond the fistulous tract and as far into the jejunum as it would go. After the tube had passed the fistulous opening in the duodenum, food and fluids were given by the tube. The drainage from the wound which had formerly amounted to from 500 to 600 c.c. every twenty-four hours dropped to about 90 c.c., and the erosion of the skin and fistulous tract was well controlled with N/10 HCl and beef juice. There was definite progress in the healing of the fistula. Everything looked very favorable until four days postoperative when the patient pulled the Rehfuss tube out. Further attempts to pass it again failed. A surgical consultant was called and we did a jejunostomy through a right rectus incision, exploring the area from the peritoneal side. There was found not only a fistula of the unperitonealized portion of the duodenum but the hepatic flexure of the colon was adherent and there was thought to be a fistula from it retroperitoneally to the nephrectomy wound. Since there was such a marked inflammatory reaction about this area, we considered it dangerous to loosen or free these adhesions. The jejunostomy was performed 15 inches from the duodenum. During the first twenty-four hours, food and water was absorbed readily through the tube and the patient seemed better. From this point on, she gradually lost ground and died twenty-one days after the nephrectomy.

The blood chemistry showed normal blood constituents until the last few days, when the non-protein nitrogen rose to 80 mg. per 100 c.c. The chlorides were unaffected but this was probably due to the large amount of saline solution given.

At the first appearance of the duodenal drainage, we were uncertain as to whether or not the duodenum might have been injured at the operation. With that in mind, the large pyonephrotic kidney was carefully searched through numerous blocks with the microscope to see if there was any duodenal tissue adhering to the kidney or the kidney pedicle. None was found. The stricture of the ureter at the ureteropelvic junction was, of course, the final cause, because it produced the stasis that formed the stones originally and the nephrotomy wound of the first operation would not completely close because of the stricture and thus the train of evil circumstances formed in turn the pyonephrotic kidney, the perinephritic abscess, and the duodenal fistula.

The finding at autopsy that the jejunum had enormously dilated and was markedly edematous explained why the jejunostomy failed to give the relief we had anticipated.

The autopsy report by Doctor Wahl is given in part. "The elbow of the duodenum and hepatic flexure of the colon are bound down firmly over the right nephrectomy area by masses of hemorrhagic fibrinous exudate. The peritoneal surfaces are moist and glistening except in this area where they are slightly congested. A large retroperitoneal cavity the size of an orange is present where the right kidney had been removed at operation. On dissecting away the colon and elbow of the duodenum, a duodenal fistula is encountered about which are several small abscess cavities. No definite opening into the colon can be found."

"The perforation of the duodenum is 10 cm. from the pyloric ring."

"In the distal part of the jejunum, an enterostomy has been performed with the insertion of a rubber catheter of 30 F. size, this operation being surgically successful. The jejunum was markedly dilated. No definite obstruction can be found."

CONCLUSION

There are 25 cases of duodenal fistula associated with and following the operation of nephrectomy to be found in the medical literature of the world. Our case makes the twenty-sixth. From the number of nephrectomies that are now performed,

TABLE I

DUODENAL FISTULAE FOLLOWING NEPHRECTOMY: CONSERVATIVE TREATMENT

Case	Date	Surgeon	Diagnosis	Operation	Appear. of Fistula	Treatment	Course	End-result
1	1918	Davis	Dead kidney	Nephrectomy	4 days P.O.	Conservative	Wound healed in 7 wks.	Cured
2	....	Korte	not given	Nephrectomy	not stated	Conservative	Healed spont.	Cured
3	1920	Legueu	Perinephritic abscess	Nephrectomy	9 mos. P.O.	Conservative	Drained 4 mos.	Died
4	1931	Lepoutre & Dupas	Sarcoma of kidney	Nephrectomy	10 days P.O.	Conservative	Drained 4 wks.	Cured
5	1914	Mayo	not given	Nephrectomy	4 days P.O.	Conservative	Drained 14 days	Died
6	1914	Mayo	Ca. of renal pelvis	Nephrectomy	5 days P.O.	Conservative	Drained 10 days	Died
7	1914	Mayo	not given	Nephrectomy	.....	Conservative	Drained 14 days	Died
8	1914	Miller	Renal T.B.C.	Nephrectomy	1 day P.O.	Conservative	Drained 7 days	Died
9	1912	Payr	not given	Nephrectomy	2 yrs. P.O.	Conservative	Gradually sealed	Cured
10	1924	Pignatti	T.B.C. Pyelonephrosis	Nephrectomy	15 days P.O.	Conservative	Intermittent drainage. Emaciation	Died
11	1921	Pousson	Pyonephrosis	Nephrectomy	10 days P.O.	Conservative	Drained for several hrs.	Died
12	1911	Rigby	Pyonephrosis	Nephrectomy	62 days P.O.	Conservative	Drained for 2 mos. & healed	Cured
13	1923	Gaminara	Tumor	Nephrectomy	10 days P.O.	Conservative	Healed upon syphonage	Cured
14	1920	Fischer	T.B.C.	Nephrectomy	4 days P.O.	Conservative	Healed spont. 8 wks.	Cured
15	1932	Boyd	.....	Nephrectomy	.....	Conservative	.....	Died

TABLE II

DUODENAL FISTULAE FOLLOWING RIGHT NEPHRECTOMY: OPERATIVE TREATMENT

Case	Date	Surgeon	Diagnosis	Operation	Appear. of Fistula	Treatment	Course	End-result
16	1911	Esau	Rt. Renal abscess	Nephrectomy	3 days P.O.	Jejunostomy 6th day	Drained 9 days	Died
17	1915	Mayo	Nephrolithiasis	Nephrectomy	30 days P.O.	Immediate suture Fistula	Uneventful recovery	Cured
18	1920	Michou	Infected hydronephrosis	Nephrectomy	25 days P.O.	Suture Fistula	Drainage stopped within 24 hrs.	Cured
19	1927	Morogna	Nephrolithiasis. Renal T.B.C.	Nephrectomy	4 days P.O.	Extraperitoneal Suture Fistula	Drainage stopped	Cured
20	1924	Pignatti	Nephrolithiasis. Ureterolithiasis	Nephrectomy	7 days P.O.	Suture Fistula	Drainage stopped	Cured
21	1920	Pousson	Pyonephrosis	Nephrectomy	10 days P.O.	Suture Fistula	Drained for 12 days	Cured
22	1913	Thevenard	Renal T.B.C.	Nephrectomy	days ?	Gastroenterostomy, 10 yrs. later	Healed 9 days P.O.	Cured
23	1903*	Von Cackovic	Sarcoma of kidney	Nephrectomy	10 days P.O.	Jejunostomy 17 days P.O.	Drained for 19 days	Died
24	1927	Ockerblad	Perinephritic abscess & pyonephrosis	Nephrectomy	24 hrs. P.O.	Ileostomy	Drained 24 days	Died
25	1912	Payr	Pyonephrosis	Nephrectomy	8 days P.O.	closed by operation 2 yrs. after Nephrectomy.	Drained for 2 yrs.	Cured
26	1926	Kearns	Hydronephrosis	Nephrectomy	.....	.....	.....	Died

this would seem to be an extremely rare surgical accident, but we believe all cases are not reported and fear that some are not even recognized as duodenal fistulae. It is a grave surgical accident. In a review of the reported cases, one finds that there are two main causes, one trauma to the unperitonealized portion of the duodenum with an artery forceps, and the rarer cause of erosion due to perinephritic abscess, as in our case. The mortality is high; in a total of 25 cases, there were 12 deaths. The surgical or operative treatment shows a mortality of less that one-half that of the conservative or non-operative treatment. As small a series as this spread among twenty-two attending physicians over a period of twenty-four years does not lend itself well to statistical study. Only one man saw as many as 4 cases. The knowledge gained from the experience of these men will undoubtedly be of value for the care of future cases. Over 25 per cent of the duodenal fistulae occur following nephrectomy.

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[For Remainder of References see p. 121.]

DIAGNOSIS OF RENAL TUBERCULOSIS*

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SEVERAL years ago, we reviewed the records of the Jefferson Hospital of surgical renal tuberculosis to check the end-result and to get data which would serve as a basis for an early diagnosis. The study was enlightening inasmuch as it failed to elucidate either purpose. We then reviewed the literature, old and new, on the subject and found ardent support for most any view we cared to accept. The present study is an attempt to build up a safe working method for the early diagnosis of renal tuberculosis and to reliably estimate indications for surgical intervention. To do this, we have drawn upon the experience and the methods of many workers in many fields as well as upon our own observations.

Tuberculosis of the kidney is practically never the primary tuberculous lesion; it is always secondary to another one, most frequently phthisis. Notions regarding the avenues of tuberculous renal infection have changed considerably in the last decade. It was supposed that infection by the lymphatics, by the urinary tract, ascending infection and the hematogenous route were of about equal importance. The blood stream, as Huebschmann[1] says, is the only avenue deserving serious consideration. Stoerch[2] points out that if ascending infection were as common as it is supposed to be, one ought to be able to demonstrate more often the progressive nature of the lesions from the lower urinary tract to the kidney.

The older pathologists formulated the concept that tubercle bacilli were often excreted by a sound kidney without necessarily producing a lesion. If this be true any judgment formed of the presence of a renal tuberculosis by the discovery of the tubercle bacillus in the urine rests on very doubtful premises. The very careful and painstaking work of Medlar and Sasano,[3] Lieberthal and v. Huth,[4,5] Menton,[6] Dimtza and Schaffhauser[7] prove the error of this concept. If the renal epithelium permits the passage of tubercle bacilli through it, there is renal damage and that damage is in the nature of a tuberculous lesion, be it ever so small. Tubercle bacilli in the urine are indicative of a tuberculous infection of the genito-urinary tract.

Once the presence of a lesion has been established, the confirmation of its tuberculous nature depends upon the isolation of the tubercle bacillus from the urine. The three methods, viz: direct microscopic examination of urinary sediment for tubercle bacilli, inoculation of guinea pigs with suspected material and culture for the recovery of the tubercle bacillus are employed. More discrimination in the use of these methods ought to be used; the reason for it deserves comment at this time.

We must insist that the exclusive use of the first method is inadequate and dangerous. The finding of acid-fast bacilli in smears made from urinary sediment is usually but not always indicative of tubercle bacilli. The oft recorded statement that B. tuberculosis may be confused with B. smegmatis and other acid-fast

* Read before the Philadelphia Roentgen Ray Society.

organisms is a truth well worthy of consideration. In every case this method should be employed in conjunction with the inoculation of guinea pigs with suspected material and the use of cultures, or both.

We have come to believe that all three methods should be employed in each case for the reason that follows. It is obvious that microscopic smears by themselves are not absolute confirmations of a diagnosis. The second method, that of the inoculation of guinea pigs with tuberculous material, has some serious handicaps. Even with good technique there are a certain number of failures. Barney and Young[8] reported 1 per cent of error by this method; Hyman and Mann[9] 36 per cent of error in a total of 48 cases, and I have had 9 failures in 28 cases of proved renal tuberculosis. The failures are usually due to the premature deaths of the animal from intercurrent infections or from infection due to the introduction of other pathogenic organisms with the sediment. The inoculation of animals has one advantage which a culture can never have, it is a demonstration not only of the presence of the organism but also of its pathogenicity.

The cultural method is a very useful and satisfactory one. Such methods have been devised by Petroff,[10] Hohn,[11] Lowenstein[12] and Corper and Uyei.[13] We have employed these methods not only in renal tuberculosis but in other forms of the disease. The most luxurious growths have been obtained on the mediums of Lowenstein.[12] Corper's[13] method has yielded a large number of positive cultures. It is a most useful method and seems as reliable as the average clinical laboratory method. The success of recovering B. tuberculosis on these mediums seems to depend mostly upon the proper preparation of the mediums. Great care must be exercised to carry out the exact instruction of the author in its preparation.

Cultural methods in our hands have yielded a slightly greater number of positive results than the inoculation of suspected material in the guinea pig. We made 250 urinary cultures for recovery of tubercle bacilli and simultaneously inoculated animals with some of the material. Of 28 positive tests for B. tuberculosis, 15 were positive by both methods, 9 by the cultural method but not with animals, and 4 were positive with guinea pigs but not in the culture. The great disadvantage of the cultural method is contamination by molds that are introduced with the suspected material. This can sometimes be avoided by seeding more than one tube of medium. Culture media do not support a good growth of the bovine tubercle bacillus. The cultural method gives earlier positive results; it is cheap, reliable and simple enough to be carried out in the average clinical laboratory and by those with average skill and experience.

The use of all three methods in every case diminishes the chance of error in diagnosis, and overcomes the disadvantages inherent in each procedure. We believe that renal tuberculosis is serious enough to warrant all of the aid which the laboratory can contribute. In those cases where all of the clinical pathological methods have failed and where the real nature of the lesion has been demonstrated at autopsy, we have invariably found a tuberculous lesion in the kidney parenchyma not communicating with the pelvis or a ureter occluded by scar tissue.

Urologists have not been primarily interested in the early diagnosis of tuberculosis in the urinary tract, because their problem revolved about the relative merits of surgical or non-surgical intervention. Today it is conceded that if the same cooperation is accorded the urologic patient that is now a matter of routine for the pulmonic sufferer, our results in the management and early diagnosis of renal tuberculosis will improve proportionately.

It is felt that in a large percentage of cases of unilateral renal tuberculosis, the bacilli reach both kidneys, but that in the vulnerable kidney the process is

progressive, while in the other the infection is overcome before it extends to the medulla. We can hardly escape the conclusion that when tubercle bacilli are present in the blood stream in sufficient numbers to infect a kidney, probably they are carried to the opposite kidney as well as to other organs. There seems to exist a special reason or factor which is often called a "local lowered resistance" that enables infecting organisms to gain a foothold in that particular kidney. It seems probably in many instances that the determining factor in the genesis of unilateral renal tuberculosis is some degree of mechanical obstruction to the outflow of urine, difficult or impossible to demonstrate clinically.

The co-existence of renal and genital tuberculosis is demonstrated to a greater extent by all recent reports. In view of the fact that renal and genital tuberculosis are a secondary infection, and follow most frequently pulmonary infection, danger of distribution of the tubercle bacillus to the kidney, prostate, or epididymis is always present in a person suffering from lung involvement. The possibility of infection by interchange from the urinary tract to the genital tract is readily recognized. It is also true that many of the patients presenting themselves with urinary tuberculosis are free from any genital involvement. However, if the latter is the presenting condition, the percentage of urinary tuberculosis is greater. The early appearance of genital tuberculosis in the epididymis is usually the reason for their appearance in a physician's office, whereas, early renal tuberculosis may not be brought to their attention until definite bladder symptoms are noted.

One may safely believe that the incidence of bilateral renal involvement will increase in direct proportion to the thoroughness and accuracy in diagnosis. With the refinement of new cultural methods for growing tubercle bacilli as well as renewed interest in developing better technique for showing the organisms in smears, coupled with the refinements in pyeloscopy and pyelography, we will be able to make more correct diagnoses in renal infections. Not only is it important not to overlook a bilateral case and perhaps perform an unnecessary surgical operation, but the opposite condition may exist in which the case has been erroneously diagnosed as bilateral renal tuberculosis. By this diagnosis, the patient may be deprived of surgical treatment when the only therapeutic agent at hand is nephrectomy.

It is important to have information at hand relative to the pulmonary condition of the patient. One routine is to have a roentgen ray of the chest in addition to the physical examination. Many patients are not aware of the fact that they have pulmonary tuberculosis, or if they are cognizant of this fact, they say nothing about it because the urinary symptoms predominate in the picture.

Adult tuberculosis is usually a chronic disease. In the urinary tract the most acute symptomatology is often present. On the other hand, patients are examined who complain of no urinary symptoms whatsoever, and yet have marked renal destruction with active tuberculous infection. The severity of the urinary symptoms depends largely upon the amount of infection of the bladder. It is admitted by all urologists that the best functional results, as far as the bladder is concerned, are obtained in cases in which there is very slight or no involvement of the bladder. It is this type of case which makes us feel that early diagnosis followed by surgical treatment before the bladder is involved is the proper method of therapy.

Recently one of us[14] reported a group of cases in which the bladder presented a marked tuberculous involvement. This was rather surprising as the majority of reports mention the fact that bladder infection has been greatly reduced. Essentially, this is true. However, in our clinic we see rather frequently the contracted, irritable, tuberculous bladder. The ulcerated "golf hole" meatus is becoming steadily more rare. In more than half of the bladders ex-

amined, some condition about one or the other ureteral meatus made us suspicious of renal tuberculosis.

We employ ureteral catheterization in all cases of suspected renal tuberculosis and specimens of urine are collected for direct examination, culture and inoculation of a guinea pig. The question of catheterizing an apparently normal side in the presence of a known infected side is debatable. If we have a non-functioning tuberculous kidney on one side and the meatus presents a normal appearance on the other, with a normal indigo carmine function, we refrain from further catheterization. On the other hand, if both kidneys give a good functional dye test, we investigate both kidneys as to the possibility of bilateral renal tuberculosis. We do not feel that excretion urography is sufficiently positive to make this distinction for us, as some urologists believe.

The use of indigo carmine intravenously as a functional dye test has not in our experience added much to the diagnosis. In like manner we found chemical studies of the blood valuable in advanced destructive lesions.

In employing urography in the diagnosis of renal tuberculosis, one should always follow the fundamental principle that it is unnecessary if a diagnosis can be made without it (Braasch[15]). In many instances, the bladder and the ureteral orifices show no definite evidence of tuberculosis or no suggestion of it, and the cultures and smears give negative results; ureteropyelography is the only means of identifying the lesion present. Pyelograms are indispensable in the diagnosis of early lesions of tuberculosis.

Many urologists have the roentgenologist make simultaneous bilateral pyelograms. It is not our practice to do this at Jefferson, although every pyelogram made is done under fluoroscopic control. It is the exception rather than the rule to inject the renal pelvis by a syringe. We use the gravity method of allowing the sodium iodide solution to run into the renal pelvis, gauging the flow under the guidance of the roentgenologist. It is felt that this method tends to give less irritation to the patient.

The early pyelographic filling defect found with renal tuberculosis is produced by a small area of renal destruction, a cortical abscess. It is usually found at the tip of a calyx. As the destruction becomes more marked, the filling defect is more noticeable and the typical feathery, fuzzy shadow of the calyx appears.

Intravenous urography or excretion urography often fails to outline pelvic deformities. In early tuberculosis, the substances in use today (Neo-iopax or Neo-skiodan) do not delineate the minor calyic and pelvic deformities. In cases where there is some ureteral obstruction as is often the case in tuberculous ureteritis, enough of the solution may remain in the kidney pelvis and thus bring out the pelvic deformity. It is only in advanced cases in which destruction and pyelectasis are marked that the specific deformity is recognizable. Retrograde pyelography still maintains its place as the more accurate method of roentgenologic diagnosis.

SUMMARY AND CONCLUSIONS

1. Renal tuberculosis is always secondary to a tuberculous lesion elsewhere in the body.

2. The clinical pathologist should base his confirmation of renal tuberculosis on more than a single laboratory test and never limit it to the discovery of acid-fast bacilli in stained urinary sediment.

3. Excretion urography as an aid in the diagnosis of early renal tuberculosis should be evaluated only in conjunction with the findings of the pathologist and the urologist.

4. The diagnosis of renal tuberculosis can only be made by a thorough and complete urologic study, which includes the cooperation of the internist, pathologist, and roentgenologist.

[For References see p. 134.]

INFLUENCE OF HYSTERECTOMY ON ENDOCRINE BALANCE*

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LOS ANGELES

BETWEEN the glands of the endocrine system there exists an interdependency of functions and secretions resulting in a certain equilibrium necessary to well-being.

The adaptability and functional elasticity of these glands has a certain range which varies according to sex, type, age, and other characteristics of the individual.

The reproductive phase in a woman's life is under the special control of the pituitary gland, or hypophysis, and the ovary. The two key hormones known to us to govern the female sex functions are the follicle stimulating hormone, or gonadotropic hormone, of the hypophysis (related to the commercial products called A.P.L., prolan, and antuitrin s), and the follicular hormone of the ovary (also called estrin and thelin).

These hormones have reciprocal relations to each other, to other hormones of the same glands, and also to the secretions of other endocrine glands, especially thyroid and adrenals.

The life of the mature woman is characterized by cyclic biological changes finding their main expression in ovulation and menstruation. The cyclic changes of the ovary are accompanied by characteristic mutations of the normal endometrium and also by other rhythmic changes of endocrine and chemical nature. Among the other changes coinciding with the menstrual curve are periodic variations in the basal metabolic rate. These coordinated cyclical changes may continue for a limited time after the process of menstruation has stopped, and even when all ovarian and uterine tissue is absent.

Among the endocrine changes accompanying the menstrual phase which were recently widely studied are the variations of the follicular hormone content in blood and urine. Robert T. Frank of New York, Fluhmann of Stanford, and others made hormone assays in hundreds of women and found typical rhythmic changes in the content of sex hormone of blood and urine during the menstrual cycle. There was a characteristic accumulation of the follicular hormone in the blood and urine several days preceding the onset of menstruation, which dropped shortly before and disappeared during menstruation.

Disturbance or suppression of normal menstruation seems to interfere with the natural regulation of the hormone content in the body fluids. Persistance of the high premenstrual hormone level, or even a rise above it (so-called hyperestrinism), is likely to follow when the anticipated menstrual process is interfered with.

Clinical manifestations characteristic of an abnormal accumulation of follicular hormone are a peculiar nervous tension and vascular congestion of various parts of the body. These symptoms are usually relieved if menstruation recurs.

At this point, I have to mention that all clinical manifestation of endocrine disturbances present similar features, even when originating from entirely different sources. They are chiefly expressed through the sympathetic and parasympathetic nervous systems, and these systems have only a limited number of forms of expression, mainly of vasomotor nature. The appear-

* Read before the Los Angeles Surgical Society.

ance and intensity of clinical symptoms from endocrine disturbances also depend upon the nature of the individual; especially upon the primary nervous stability.

A special predisposition to hyperestrinism is brought about by the sudden suppression of menstruation through hysterectomy, and apparently is the more likely to follow, the more normal was the function of the uterus before operation.

Hyperestrinism is in the majority of cases a transient endocrine state. If the conditions responsible for it persist for a longer time, it is usually followed by gradual diminution of ovarian function and secondary symptoms characteristic of the menopause.

The facts before mentioned seem to suggest that the inter-relation and functional dependency of the ovary and the uterus are not one-sided, but to a certain extent reciprocal. There are other indications supporting the theory that the uterus is not only an organ of gestation but an important organ of endocrine regulation. It may be compared to the balance-wheel in a motor which has no locomotive power of its own but serves to regulate the smooth run and rhythm of the motor. The most active part of the uterus biologically, the endometrium, seems also responsible for the retrograde influence which the uterus exerts upon the ovary. Interference with the normal activity of the endometrium is likely to become reflected in functional changes of the ovaries, and secondarily in the hypophysis. Such a retrograde effect of endometrial function on the correlated endocrines seems to be indicated by observations made by Aschheim and Zondek, who found that in tumors interfering with normal endometrial function, such as certain fibroids and carcinomata, the endocrine picture is often changed in a direction similar to that found after castration and menopause. They observed in a large percentage of such cases an excess of the anterior pituitary hormone (prolan) in blood and urine, a condition that normally exists after menopause.

During the normal menopause, the ripening of the graafian follicles gradually slows up, frequently becomes incomplete and occurs at less regular intervals. Ovulation correspondingly becomes less frequent and less regular. The production of follicular hormone is decreased and less of it can be found in the body fluids. These endocrine changes are reflected in corresponding changes of the process of menstruation which occurs in increasingly longer intervals and decreases in strength. The decrease of follicular hormone leads also to atrophy of the other generative organs and the mammary glands.

At the same time as the ovarian function decreases, other endocrine glands are losing their counter-balance and are increasing their own activity. The anterior lobe of the hypophysis, the thyroid and suprarenals accelerate their functions. A marked hypertrophy of the anterior lobe of the pituitary is found during the menopause, and the follicle stimulating hormone of the hypophysis in blood and urine appears in greater amounts, apparently in the same ratio as the follicular hormone is diminishing, taking its place as it were. The more consistently and gradually the ovarian activity declines, the more time have the other endocrine glands to adjust their functions, and the less disrupted becomes the endocrine balance. The more unnaturally and abruptly the ovarian function is disturbed, the more easily the endocrine equilibrium becomes upset.

The classical symptoms of endocrine disturbance characteristic of menopause are hot flushes, headaches, vertigo, insomnia, and increase of reflex irritability. These symptoms often show certain cyclic changes in their intensity and periodic aggravations.

During the last few years numerous investigators have tried to establish the actual relation between the activity of the endometrium and ovarian function. This problem was studied in many animal experiments. In experiments on the guinea-pig Leo Loeb of Washington University

found that removal of all or part of the uterus was followed by prolongation of life and function of the corpus luteum, and had an indirect effect of preventing ovulation as long as the corpus was functioning. Several other workers reported results of uterine transplantation on ovarian function in animal experiments. Zimmerman of the University of Jena transplanted pieces of endometrium into the abdominal wall in hysterectomized rabbits, and found that regressive changes in the retained ovary were inhibited as long as sufficient uterine tissue remained viable. Other investigators got corresponding results in certain species of animals, but not so in other species. Sessums and Murphy of the University of Pennsylvania made a thorough experimental study concerning the gross microscopic structure of ovaries of rabbits removed several months following hysterectomy, and based their observations on 52 animals. In 26 of these the endometrium was auto-transplanted at the time hysterectomy was done. Object of the study was to determine whether structural changes occur in the ovary of the rabbit as a result of hysterectomy. If so, what was their nature. The other questions to be answered were whether the loss of endometrium is a factor in bringing about these changes; and if these changes can be inhibited by auto-transplantation of the endometrium. They arrived at the following conclusions:

> Hysterectomy upon the rabbit inhibits the development of estrus and brings about changes in the microscopic structure of the remaining ovaries which tend to be both inhibitory and degenerative in nature. Auto-transplantation of endometrium has a tendency to limit the extent of the inhibitory and degenerative changes which result from hysterectomy. Evidence is brought forward to support the theory that the endometrium elaborates a hormone which influences the ovary.

Among other prominent gynecologists in this country the late John Osborne Polak expressed the opinion that all ovarian transplants live longer if sufficient endometrium is retained to maintain the interrelation between the ovarian and endometrial hormones.

In accord with the mentioned animal experiments is the clinical experience that hysterectomy hastens the onset of menopause. All investigators have come to the conclusion that hysterectomy hastens the onset of menopause, but they could not agree concerning the next important question: whether retention of one or both healthy ovaries has a retarding and mitigating effect on appearance and intensity of menopausal symptoms.

For the last thirty years two groups of gynecologists have maintained opposite opinions on this point. Investigators on both sides have accumulated a large amount of material to support their contentions. William Graves believed that the so-called menopausal symptoms are observed with practically the same frequency after removal of the uterus either with or without removal of the ovaries, and attributed the symptoms to a break in the utero-ovarian functional harmony. He regarded retention of ovarian tissues after hysterectomy as of little or no physiological value, and even productive of possible harm to the patient.

Basing his conclusions on a series of 300 cases in which hysterectomy was done with conservation of the ovaries, Polak stated that the average period of life of the retained ovary was only two years, and that it was always a focus of possible trouble. He, like many other observers, found a tendency to cyst formation in retained ovaries.

The retrogressive and degenerative changes in retained ovaries he also attributed to the impairment of circulation brought on by interruption of the collateral blood supply from the uterine vessels. He found that even when the most detailed technique was observed, any type of hysterectomy interfered with the ovarian circulation.

Many prominent English, French, and German gynecologists hold also the opinion that ablation of the uterus is ultimately

followed by atrophy of the ovary as a result of the lack of the internal secretion normally supplied by the uterine glandular tissue, the endometrium. Recently Whitehouse of the University of Birmingham expressed the same ideas. He based his opinion on his own observations and on results of a detailed investigation by his predecessor, Thomas Wilson, of several hundred hysterectomies.

On the other side of this question are the findings of Hawks of the New York Hospital, who arrives at directly opposite conclusions. Studying the postoperative histories of 84 cases of hysterectomy, he found that menopausal symptoms were delayed and their severity diminished when one ovary was left, and still more when both were conserved. He found very little harm caused by retained ovaries.

Leda J. Stacey of the University of Minnesota published in 1931 the results of a similar investigation based upon histories of 218 patients of the Mayo Clinic. These patients had been operated on at an age of thirty-eight years or less, several years previously. In summing up her material she found of 167 patients with hysterectomy who had either one or both ovaries remaining, 39 per cent reported the most characteristic symptom of menopause, hot flushes. However, of 51 patients from whom both ovaries had been removed with the uterus, 78 per cent (exactly double the number) noticed hot flushes. The onset of hot flushes was earlier in the group from which all ovarian tissue had been removed. Hence the conservation of ovarian tissue did not prevent the occurrence of hot flushes in 39 per cent of the cases, but it lessened their incidence and retarded the time of onset after operation.

In 1932 Sessums and Murphy published two papers about surgical menopause after hysterectomy with and without ovarian conservation. They studied a series of 91 women in whom hysterectomy had been performed before the age of thirty-six years with the retention of one or both ovaries, with reference to the incidence of menopausal symptoms occurring before the age of forty. The frequency of these symptoms after hysterectomy was 44 per cent, approximately eight times that occurring in the control group of women not operated upon. Of the hysterectomized patients exhibiting menopausal symptoms before the age of forty, 92 per cent did so within two years after operation. Of 86 women in whom supravaginal hysterectomy had been performed 36 per cent showed signs of menstruations following operation. Menopausal symptoms were noticed less often in these patients who retained menses. Menopausal symptoms appearing before the age of forty were observed more often in patients in whom one ovary had been removed than when both had been conserved.

In the more recent article, the same authors compared the symptoms of the before-mentioned 91 women subjected to hysterectomy with retention of ovarian tissue, with the postoperative histories of 52 women subjected to bilateral oophorectomy with the hysterectomy, both groups under the age of thirty-six years. The summary of both papers was that hysterectomy usually hastens the onset of menopause but that menopausal symptoms occur in more patients, appear sooner, and are more severe when all ovarian tissue was removed than when one or both ovaries were conserved. Therefore they recommend ovarian conservation in hysterectomy.

SUMMARY

It seems safe to accept the conclusion of Sessums and Murphy as the best answer to this old controversial question. In summing up the other points brought out in this paper, I hope I have elucidated the evidence derived from experimental and clinical observations indicating that the uterus is not only an organ of reproduction but plays an important part in the regulation of endocrine balance during the period of sex maturity.

The endocrine importance of the uterus should be taken into consideration when

we deliberate the indications for surgical procedures on the uterus, especially when dealing with inflammatory conditions or tumors of a benign nature.

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VALUE OF THE X-RAY IN THE DIAGNOSIS OF THE ACUTE ABDOMEN*

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IN going over the hospital records of some years past there is a surprising lack of the use of the *x*-ray as an aid in the diagnosis of the surgical abdomen. Recently this condition is gradually being corrected as the surgeons have begun to realize the value of the information that may be gained from a simple *x*-ray examination.

It is the intention of this paper not to present new theories, but to bring out known factors which are valuable when added to the signs and symptoms presented by the patient and so being of assistance to the surgeon in determining preoperatively what he may expect to encounter at the operating table. On the other hand, the information gained may prevent an operation due to an error, particularly in the infant where there is a question of a pneumonic process in the right lower lobe or an acute appendicitis. In the adult, there is the patient with a ruptured peptic ulcer without the classical history of a gastric syndrome in which the patient is taken with sudden gastric pain, rigidity of the abdomen, vomiting, etc. The possibility of a coronary thrombosis instead of a perforated ulcer should be kept in mind. It is in this type of case that the abdominal *x*-ray may aid in the determination of the presence or absence of air in the peritoneal cavity, and so be an important factor in the final decision.

The examination of the patient consists of taking one radiograph of the abdominal region in the supine position and another in the upright. In spite of the fact that the patients are acutely ill, we have little difficulty in making the exposures in a well-equipped *x*-ray department. The upright film is made with the patient held in a sitting position in bed or on a carriage with the plate held on the lap or on a suitable plate holder. The supine exposure can be made with or without the Potter-Bucky diaphragm. It is important that the plate be taken high enough to bring in the diaphragm and the lower part of the chest.

The diagnosis depends upon the demonstration of abnormal collections of air or fluid in the abdominal cavity or the intestinal tract. When an ulcer perforates, air is permitted to escape into the abdominal cavity and it is usually demonstrated between the right dome of the diaphragm and the upper surface of the liver. This is aided by having the patient lie on the left side for a short time before making the exposure.

When gastric content and fluid have escaped into the peritoneal cavity a distinct fluid level can be seen in the space between the diaphragm and liver as seen in Figure 2.

In intestinal obstruction due either to a mechanical cause, such as acute angulation or volvulus, or to stasis from a peritonitis with ileus, there is an excretion of fluid into the lumen of the gut. This fluid content collects within six to eight hours and with the accumulation of gas reveals itself as single or multiple fluid levels in the abdomen. By the study of the location, extent, and contour of the accumulations one may determine whether or not there is small bowel distention, or the simple

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collections of gas in the colon. Fluid levels seen in the upper abdomen suggest a high ileus. When there are numerous fluid levels, and some in the lower part of the abdomen a low ileus is indicated.

Several recent cases from the files of the Mary Immaculate Hospital illustrate the points made.

Case I. C. D., aged thirty-eight, admitted December 15, 1934 with a history of sudden sharp pain in the epigastrium followed by vomiting the morning of admission. The patient had been suffering from intermittent attacks of epigastric pain for the past year, the pain coming on about twenty minutes after eating and relieved by bicarbonate of soda. There was no history of hematemesis or tarry stools. Physical examination on admission showed a well-developed man acutely ill with legs drawn upon the abdomen and complaining of extreme epigastric pain. Chest examination negative. Blood pressure 128/82. Abdomen showed boardlike rigidity with exquisite tenderness in the epigastrium. Blood count: W.B.C. 19,100, polymorphonuclears 78 per cent, lymphocytes 17 per cent, eosinophilis 5 per cent. The *x*-ray of the abdomen showed air between the right dome of the diaphragm and liver indicating a perforation with the escape of air into the peritoneal cavity. At operation, on opening the peritoneum, a large quantity of thick purulent fluid was found in the upper abdomen. An ulcer about 3 cm. in diameter was found in the duodenum just distal to the pylorus with a perforation at its center.

Case II. J. B., male, aged sixty-five years, admitted Nov. 10, 1934, with a history of being seized with an acute pain in the abdomen about three hours before admission. Pain was constant and generalized over the abdomen. There was no vomiting. Past history showed questionable tarry stools. A few years previously, the patient was operated upon for a "cyst" of the abdomen. No cardiac history. Physical examination on admission showed a well-developed male, not complaining of much pain. The abdomen was not distended. Tenderness was elicited over the entire abdomen but most pronounced in the right quadrant. Rebound tenderness was present. There was rigidity of the right rectus. Examination of the heart showed slight enlargement to the left. There was a systolic murmur at the apex. B.P. 110/72. Radial arteries sclerotic. Blood Count: W.B.C. 13,500, polymorphonuclears 86 per cent, lymphocytes 11 per cent, eosinophiles 2 per cent, myelocytes 1 per cent. Due to rather indefinite abdominal signs, no vomiting, etc., it was at first thought that this case was primarily cardiac. An electrocardiographic examination was done and no evidence of a coronary thrombosis was found. *X*-ray examination of the abdomen (Fig. 2) showed a collection of air between the diaphragm and liver on both sides indicating a perforation with the escape of air into the abdominal cavity. At operation, on opening the peritoneum a thick mucoid substance was found exuding from a perforated ulcer of the duodenum, just beyond the pylorus.

Fig. 1. Case I.

Case III. P. M., male, aged sixty-one years, admitted December 7, 1934 with the following history: About one hour after supper the night prior to admission he was seized with a sudden acute, agonizing pain in the upper abdomen. The pain was constant. Soon after he began to vomit, the vomiting persisting. The past history revealed vague attacks of indigestion consisting of regurgitation, dull pain in

epigastrium and occasional vomiting. No history of jaundice, clay colored or tarry stools. There is also a past history of occasional precardial pain but no radiation and no dyspnea. Physical examination showed an adult male, acutely ill, complaining of severe pain in epigastrium. Lungs clear. Heart showed no enlargement; sounds regular. There was a systolic murmur at the apex with a to and fro friction rub. The abdomen showed definite rigidity, which at times appeared to diminish. Patient was admitted with a diagnosis of a perforated peptic ulcer. Blood Count: On admission, W.B.C. 17,400, polymorphonuclears 87 per cent, lymphocytes 5 per cent, monocytes 8 per cent. *X*-ray examination of the abdomen showed no free air in the peritoneal cavity and no air between the diaphragm and liver. There was no suggestion of intestinal obstruction. These findings about thirty hours after onset were rather conclusive that the pathology was not an abdominal perforation nor an acute intestinal obstruction. Electrocardiograph showed some muscular disease with possible coronary involvement. The findings pointing toward coronary disease; the patient was treated as such and showed continued improvement until the tenth day when he suddenly expired. Autopsy showed a cardiac infarct due to a coronary thrombosis involving the interventricular septum, of recent origin, and also a new thrombus which probably caused the sudden death. The gastrointestinal tract showed no pathology. There was no sign of a perforated ulcer nor any peritonitis.

Fig. 2. Case II

Fig. 3. Case III.

Case IV. R. B., aged fifty-four years, admitted October 30, 1934. With a history of being suddenly seized with a sharp pain over the upper right side of the abdomen five days before admission. Pain was intense and constant. Patient had a similar attack three weeks prior which lasted a short time. Two days after the attack patient noticed clay-colored stools. For the past five years he has had a vague history of indigestion, particularly after taking fats, and complained of gas distention. Physical examination shows male patient not acutely ill. Tenderness and rigidity noted in upper abdomen particularly the right side. Blood Count: W.B.C. 14,450, polymorphonuclears 80 per cent, lymphocytes 18 per cent, monocytes 2 per cent; temperature 100°F. Inasmuch as the patient was not acutely ill, a small barium meal was given by mouth, and the abdomen and gastrointestinal tract were studied. The six hour plate is shown as Figure 4, and demonstrated the presence of a gallstone about 1.5 cm. in diameter. There is distention

of the duodenum due to adhesions between the gall bladder and descending portion. During the fluoroscopy it was noted that the right dome of the diaphragm was elevated and fixed. A chest plate was then made (Fig. 5) and revealed the presence of a subphrenic abscess. The acute condition subsided, temperature came down and an operation was done four days later. On opening the upper abdomen about one quart of bile-stained seropurulent fluid was found in a cavity walled off from the rest of the viscera. The cavity was drained and no further exploration was done. Further operation for the correction of the patient's pathology is contemplated.

Fig. 4. Case IV.

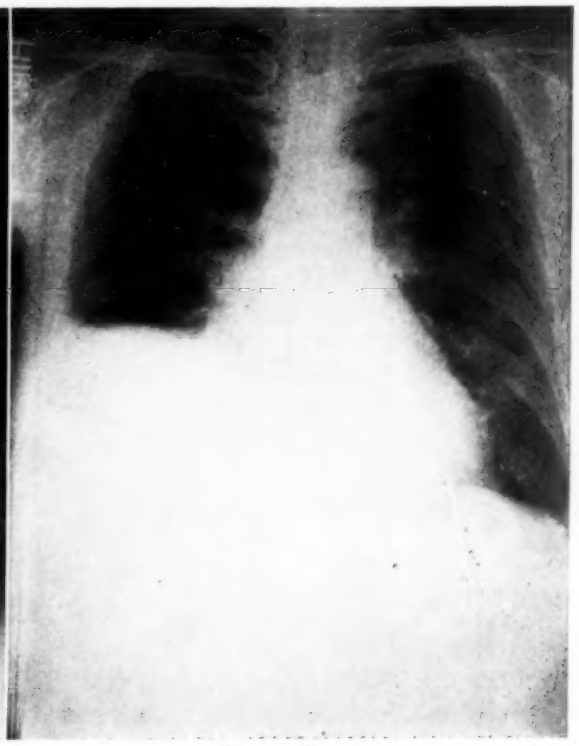

Fig. 5. Case IV.

Case V. H. M., aged thirty-six, admitted December 22, 1934 with the following history: On the evening prior to admission patient was suddenly seized with severe colicky pains in the abdomen around the umbilicus. Pain was intermittent. Soon after the pain started, patient began to vomit. Vomited during the night. The vomitus was bile stained, not bloody, not fecal. He has had no bowel movement since onset. There was a past history of several attacks of gastroenteritis associated with vomiting. Physical examination showed a well-developed male, not acutely ill, complaining of generalized abdominal pain. The abdomen was distended with moderate rigidity. Tenderness was elicited over the region of the umbilicus and a little to the right. No masses were palpable, no palpable liver or spleen. No hernia was present. No intestinal movements seen. Blood Count: W.B.C. 10,200, polymorphonuclears 85 per cent, lymphocytes 15 per cent. Temperature 100°F. *X*-ray examination of the abdomen (Fig. 6) showed an intestinal obstruction with distention of small gut seen in the left upper quadrant. Several fluid levels are visualized. In spite of these findings, namely those of intestinal obstruction as shown by *x*-ray, the patient was observed for two days at which time he showed the complete clinical picture of an acute intestinal obstruction. Operation was then performed, and showed a marked distention of the jejunum but because his general condition was poor at operation; very little exploration was done. A simple enterostomy was performed. The patient grew progressively worse and expired the following day. At autopsy a marked dilatation of the jejunum was found, and on further exploration a Meckel's diverticulum about 4 inches in length, the tip of which had fused with the base of the mesentery, thus forming a loop through which several loops of small intestine had herniated causing a gradual

intestinal obstruction. The extreme value of *x*-ray in this case was the demonstration of early intestinal obstruction two days before operation was decided upon and when the condition of the patient was such that exploration could have been done and the cause of the obstruction ascertained and relieved.

Fig. 6. Case v.

Fig. 7. Case vi.

Case vi. E. B., aged forty-six, admitted April 30, 1934 with the following history. During the past eight weeks before admission the patient was treated for a peptic ulcer. Twenty-four hours before admission she had an attack of pain in the upper right abdomen. This later radiated to the lower right quadrant. The pain was followed by vomiting which continued up to the time of admission. The past history suggested pathology of the gall bladder and there were symptoms of cardiac involvement. Physical examination on admission was negative except for the abdomen. Definite tenderness and rigidity were noted in the right lower quadrant. Rebound tenderness was elicited. There was marked hyperesthesia over the lower right quadrant. Blood count was w.b.c. 18,500, polymorphonuclears 87 per cent, lymphocytes 13 per cent. Operation was performed and an acute suppurative appendicitis was found. Postoperatively the patient began to vomit and later became distended. *X*-ray examination was made May 12, at which time there was extreme distention of the small bowel indicating an intestinal obstruction. Operation was then performed and a large abscess found about the rectosigmoid junction with adhesions surrounding it binding down the loops of small intestine thereby causing the intestinal obstruction.

I have included this case of postoperative intestinal obstruction because by the time the *x*-ray examination was made the condition of the patient was almost hopeless. It is known that the gravity of the patient's condition at the time of the second life-saving operation for postoperative obstruction can often be judged by the extent of dilatation of the small gut in the radiograph and the presence or absence of their valvular markings. When the surgeon performs the operation for obstruction he expects to find dilated loops of small intestine. If these are not found, he feels the diagnosis of acute ileus is incorrect. It is at this point that the radiographic examination for postoperative ileus is valuable. It is possible to determine

the presence or absence of dilated loops of small intestine before operation. The picture of the jejuno-ileal loops in acute

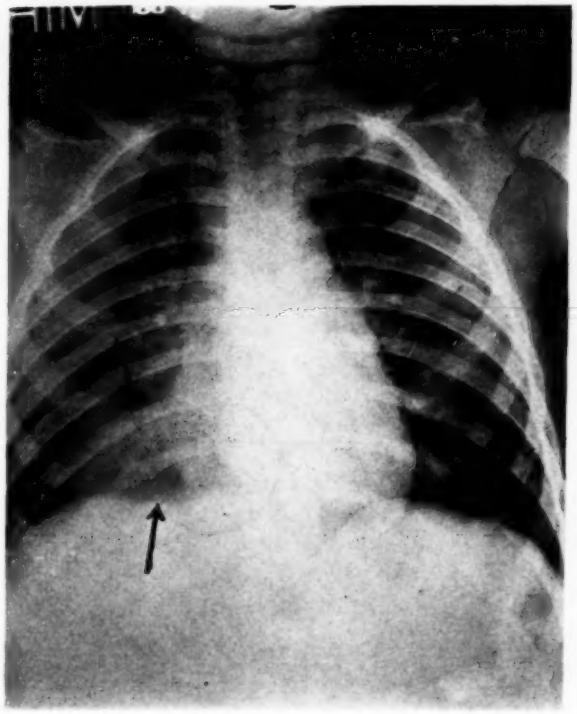

Fig. 8. Case vii.

obstruction is striking. Two types are described, namely the "herring bone" pattern, due to gas causing the folds of Kerkring to stand out in relief, giving a feathery appearance, and the more advanced type of the "ladder effect" produced by the distended loops of intestine lying parallel. When the ladder effect is present it is pathognomonic of acute obstruction and requires immediate surgical intervention. It is important to determine the presence of obstruction before this condition arises. During the early stages, a considerable dilatation of a single loop of small intestine indicates the advisability of early surgical intervention. The operation at this time is much more effective than one performed when the patient presents the radiographic picture of the extreme dilatation with laddering as illustrated in Figure 7.

The roentgen examination of the chest is of particular importance in the infant or young child. It is well known that the radiographic shadows of a pneumonic process often precede the physical signs of consolidation. The presence of a pneu-

Fig. 9. Case viii.

monia may not be made out by physical examination for days after it has been demonstrated by the roentgen picture. This fact is of special importance in the child about six to ten years of age. One of the problems encountered by both physicians and surgeons is the differentiation of a lower lobe pneumonia on the one hand and an intra-abdominal condition such as an acute appendicitis or a peritonitis on the other. The tendency of the pleuritic pain of a lower lobe pneumonia to be referred to the abdomen and to produce the reflex signs commonly associated with peritoneal irritation, may make it almost impossible to distinguish between the two clinically. This is the more true because the uncertainty arises usually during the early stages when the physical signs of the pneumonia are absent. In these cases the roentgen picture is of invaluable

service as the discovery of a pneumonic consolidation will spare the patient an unnecessary operation with all the dangers attendant upon it in the face of the pneumonia. On the other hand, a negative picture will confirm the diagnosis of intra-abdominal pathology and so lead to an early operation. Two cases are herewith presented that were admitted to the hospital with diagnoses of acute intra-abdominal pathology that required early operation. The chest examination of the first one (case of M.B., Fig. 8) revealed a pneumonic process at the root of the lung whereas the second (Case of T.B. Fig. 9) showed no pathology in the chest. The first case went through the regular course of a pneumonia with complete recovery and the second was operated upon and a suppurative appendicitis was found.

Case vii. M. B., aged five, admitted February 10, 1931 with the following history: About one week prior to admission the child was ill with a cough and general malaise. In four days the condition cleared up and child was permitted out of bed. The same evening he developed acute abdominal pain followed by vomiting. The pain became localized in the right side. Physical examination showed a child acutely ill with definite rigidity over the lower right side of the abdomen and marked tenderness over the region of the appendix. No signs of a pneumonia was made out. Blood count was w.b.c. 19,250, polymorphonuclears 78 per cent, lymphocytes 19 per cent, monocytes 3 per cent. The diagnosis of an acute appendicitis was originally made. *X*-ray examination of the chest (Fig. 8) showed a pneumonic process at the right base. Further *x*-ray study twenty-four hours later showed the consolidation considerably increased. No operation was done and the child recovered from its pneumonia.

Case viii. T. B., aged five, admitted January 14, 1935 with the following history: Eight days prior to admission the child developed a cold. Five days later he complained of pain in the abdomen and vomited. The pain in the abdomen and the vomiting persisted. Physical examination on admission to the hospital showed a child acutely ill, temperature 104°f. There was marked rigidity over the abdomen and tenderness in the lower right quadrant. Questionable signs of a pneumonia were noted. Blood count: w.b.c. 13,000, polymorphonuclears 80 per cent, lymphocytes, 8 per cent, eosinophiles, 2 per cent. *X*-ray examination of the chest (Fig. 9) showed no pneumonic process. The abdomen was included and a distended loop of small intestine was seen indicating abdominal pathology with an ileus. Operation was performed and upon opening the abdomen a large amount of free pus was found. The coils of intestine were all acutely injected and dilated. A ruptured appendix was the cause of the peritonitis.

CONCLUSIONS

The early roentgen examination of the doubtful case may add materially in determining the existing pathology. No attempt has been made to discount the usual clinical signs but emphasis has been laid on the additional information that may be gained by simple radiographic procedures to the end that an earlier operation can be performed when necessary, and no surgical intervention with its added risk in the patient where the pathology is located outside the abdomen.

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CALCIFICATION OF THE GALL BLADDER*

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RECENTLY we encountered at necropsy three instances of calcification of the gall bladder, a rare condition. We wish to summarize the literature on the subject, add our 3 cases, and record our experimental work in this connection.

The literature contains 27 clinical or pathologic reports of calcification of the gall-bladder wall, our cases bringing the total up to 30. We have included in this study all the data given on 24 of these. Five cases were published in journals not available to us, and in one instance the information given was too meager to be of value. There are also 9 instances of calcification of the gall bladder in museum specimens with few clinical or pathologic data obtainable. A few textbooks on diseases of the gall bladder have illustrations of gall bladders with calcified walls, with but few data in the text. We have omitted these from the present investigation.

Our experience with the condition is as follows:

CASE I (R1741). Mrs. C. S., a married woman seventy-three years old, was admitted to the hospital November 12, 1933, with the history of dyspnea and cyanosis for three days. She had the physical findings of bronchopneumonia. Her past history, aside from the arthritis which she had had for many years, was essentially negative. There were no symptoms suggestive of gall-bladder disease. She died three days after admission.

Anatomic Diagnosis (F. C. H.): Bronchopneumonia, both lower lobes; acute purulent bronchitis; fibrous pericarditis; senile atrophy of the uterus and appendages; calcification of the gall bladder, with a fistula between the colon and the fundus of the gall bladder.

Necropsy: "There is a thickening of the capsule of the edge of the liver near the gall bladder, and there is a gallstone on the free edge of the liver covered only by a small amount of fibrous tissue. This stone has evidently passed through the wall of the gall bladder and become embedded between the gall bladder and the lower edge of the liver. The gall bladder is 7 by 3 by 4 cm. in size. Its walls are very firm and cut with difficulty. The fistulous tract which connects the hepatic flexure of the colon and the fundus of the gall bladder is 1 cm. in diameter. The gall bladder is filled with rather soft cholesterin-bile-pigment stones, firmly embedded in a rather firm mortar-like material which fills the interstices between the stones. Stones can, however, be forced from the gall bladder into the colon through the fistulous opening by making pressure on the gall bladder. The wall of the gall bladder varies in thickness from 2 to 4 mm. and contains calcareous plaques which grate on the knife. The common duct is normal in size and the cystic duct is patent, but the orifice of the cystic duct is closed by the mass of stones."

Microscopically the gall-bladder mucosa apparently had been eroded and partially replaced by granulation tissue. There were several large calcified plaques which projected as jagged elevations from the inner surface and penetrated outward into the substance of the thickened gall-bladder wall. Throughout the wall of the gall bladder there were focal collections of lymphocytes and beneath the outer surface of the gall bladder there was considerable fat.

CASE II (R 1747). Mrs. S. C., a negro woman sixty-seven years old, was admitted November 10, 1933, complaining of lower abdominal pain, loss of weight, and bloody vaginal discharge for eight months. There was

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no previous illness. She had two children, living and well, and the family history was essentially negative. Physical examination revealed extensive ulceration of the cervix and a fixed mass in both adnexal regions. Biopsy revealed papillary adenocarcinoma, Grade III, an extension from the corpus uteri. She died November 28, 1933.

FIG. 1. A. Photograph of gall bladder in Case I (1741). Gall bladder is thickly packed with stones, walls thickened, and fundus is seen to connect with hepatic flexure of colon, a portion of which is shown.

B. Photograph of gall bladder in Case II (1747). Walls are very thick and lumen is filled with stones embedded in a rather firm matrix.

C. Photograph of gall bladder in Case III (R140–30). Mortar-like substance filling spaces between stones is well shown.

Anatomic Diagnosis (T. McCurdy): Adenocarcinoma of fundus uteri with metastases to regional and mediastinal lymph nodes and both lungs; acute bilateral ascending pyelonephritis; chronic rheumatic mitral endocarditis; small retention cysts of both kidneys; calcification of gall bladder.

Necropsy: "The gall bladder measures 8 by 4 by 4 cm.; its surface is yellowish white and the walls are extremely hard. A grating sound is produced when the gall bladder is sectioned, and calcium deposits are scattered throughout the wall. The entire lumen of the gall bladder is filled with yellowish white, facetted cholesterin-bile-pigment stones embedded in a rather firm matrix. The cystic duct is impacted with stones at its point of emergence from the gall bladder, but is otherwise patent. The common duct is normal in size and appearance."

Microscopically there was complete absence of the gall-bladder mucosa and extensive calcification of the inner three-fourths of the wall, with the calcium deposited in large plaques.

FIG. 2. *X*-ray of gall bladder in Case I (R1741). Mottled oval shadow is that of gall bladder, and fainter shadow is that made by liver.

There was practically no evidence of cellular activity.

CASE III (R 140–30). Mrs. E. M., a white woman sixty-two years old, was admitted to the hospital July 14, 1930 complaining of urinary incontinence and blood in the urine of three weeks' duration. In the past few months she had lost about 40 pounds. The past history was negative except for the repair of an umbilical hernia nineteen years ago. There was no history suggestive of gall-bladder disease. Physical examination revealed carcinoma of the urinary bladder, pyonephrosis, hypertension, and myocardial failure. She died August 5, 1930.

Anatomic Diagnosis (M. W. Barry): Carcinoma of urinary bladder; bilateral pyonephrosis; hypertensive heart disease with calcification of aortic valves and aorta; multilocular cyst of right ovary; calcification of wall of gall bladder.

Necropsy: "The gall bladder measures 7 by 3 by 3.5 cm. The walls are hard and thickened. The entire lumen is filled with facetted cholestrin-bile-pigment stones embedded in a white calcium mortar. The cystic duct is obstructed at its exit from the gall bladder."

Microscopically the mucosa was entirely absent, and there was extensive fibrosis throughout the wall. Calcium was deposited in plaques in the inner half of the wall. Blood vessels in the wall were sclerotic. A few lymphocytes were seen in some areas.

In the 27 cases reported in the literature we were able to obtain clinical histories on 18, and in the following analysis we have included the data on all of these and on our 3 cases here reported. All but one of the patients upon whom clinical data were given were females, and their ages ranged from forty-four years to ninety-four years, with an average of sixty-five. Only 9 gave a history suggestive of gall-bladder disease. Only one had ever been jaundiced and in that case it was terminal. Sixteen patients were examined roentgenologically and in all the gall bladder cast a definite shadow. The shadows were of three types. The most common type, illustrated in all of our cases, was irregular and mottled, due to the deposition of calcium in the walls in the form of plaques. In 2 cases with extensive calcification there was a diffuse even shadow diagnosed as a large stone. In one instance the gall bladder cast a ring-like shadow and a cyst of the liver was suspected clinically. The ring-like appearance was probably due to the fact that the amount of calcification in the walls was not sufficient to cast a shadow unless the *x*-ray passed through a rather large area.

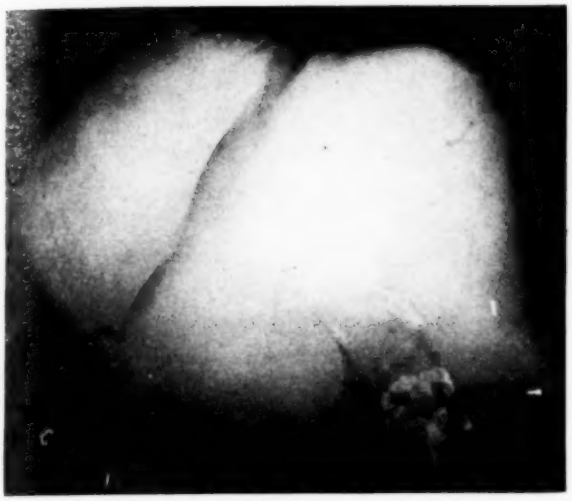

Fig. 3. *X*-ray of gall bladder and portion of liver in Case II (R1747). Calcification is most pronounced in distal half of gall bladder.

In 9 instances an operation was performed, in each case a cholecystectomy. In 8 there was no note of any particular difficulty in the operation, but in one the gall bladder was ruptured during removal. Four of the patients operated upon recovered, and in the others there was no note made of the outcome. In the remaining 12 cases the condition was found at necropsy. The findings at necropsy other than those in the gall bladder were irrelevant in 10 cases. In one case there was complete obstruction of the common duct near its bifurcation, and in another there was a large stone in the common duct and a calcified thrombus at the bifurcation of a sclerotic abdominal aorta.

Fig. 4. Photomicrograph of section of wall of gall bladder in Case III (R140–30). Dark line is calcified area. Mucosa has disappeared and wall is greatly thickened. A few lymphocytes are seen in neighborhood of blood vessels.

Detailed descriptions of the gall bladder were available in 24 cases, including 3 museum specimens. All of these gall bladders had hard thickened walls. In several cases the gall bladder was very

large, the largest measuring 16 by 12 cm. In some cases the wall appeared to be brittle and a comparison to an egg shell

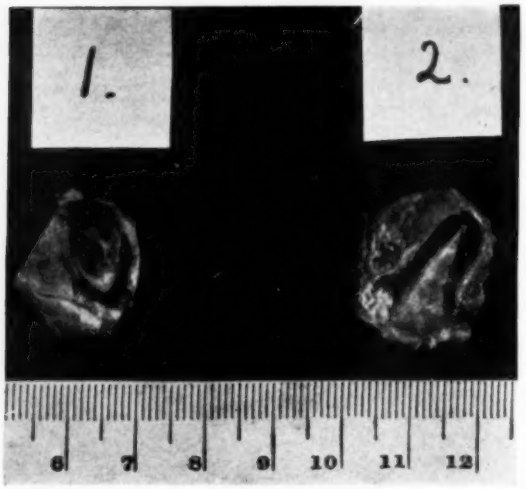

Fig. 5. Photograph of gall bladders from two rabbits showing large size, and thickened, and in places calcified, walls.

was suggested by two observers. The contents were usually cholesterin and bile-pigment stones, with some calcium carbonate irregularly deposited on the surface and between the stones, or completely cementing the stones together. Once pus was found, and in another case "milky fluid," which the author stated was rich in fat. A single large cholesterin-calcium stone filled the entire lumen of one gall bladder. In another case, the walls were converted into an osseous mass and the lumen of the gall bladder was empty. In one case the cystic duct was stated to be patent, and in 3 its condition was not mentioned. In the remainder it was obstructed, either by stones impacted in the gall bladder at the opening of the duct, or by connective tissue which had grown over the opening, or by stones in the cystic duct itself.

Microscopic studies were available in 15 cases, of which 3 were museum specimens without clinical data. In all specimens the mucosa was partially or completely destroyed. The calcium deposits were usually in the muscularis and submucosa. In all there was inflammatory change, with lymphocytic infiltration and fibrosis. Hyaline degeneration of the connective tissue was common, and twice there was ossification.

EXPERIMENTAL WORK

Since in nearly all of the clinical records it was noted that there was obstruction of the cystic duct, and that fibrotic changes had occurred in the gall-bladder wall, we decided to investigate the effect of reducing the blood supply of the gall bladder and obstructing the cystic duct of experimental animals, in order to attempt to produce similar changes in the gall bladder of these animals. Rabbits were chosen for the experimental work because of the known tendency of this animal to develop calcification.

Using aseptic technique, and under ether anesthesia, two rabbits were operated upon. The cystic duct and artery were ligated with silk thread. The gall bladder was separated from its bed on the liver and wrapped in omentum to interrupt any small vessels or lymphatics passing from liver to gall bladder. Both animals were sacrificed three months later. In both the gall bladder had enlarged to about four times normal size. The walls were greatly thickened from their normal paper-thinness up to 1 to 2 mm. Both gall bladders contained yellowish cheesy material, and in each case the cystic duct had remained obstructed. After the contents of the gall bladders had been washed out *x*-ray photographs were taken, and small but definite areas of calcification could be seen in the walls of each. Microscopic sections of the gall bladder from Rabbit No. 1 revealed rather diffuse hemorrhage into the inner half of the wall. There were collections of calcium beneath the inner surface and some calcium particles in necrotic epithelial cells on the inner surface. In similar sections from the second rabbit there were thickening, fibrosis and lymphocytic infiltration, with large calcium deposits in the inner surface of the wall.

There were also in the wall many brown-stained cells of the phagocytic type. On the outer surface there was some diffuse hemorrhage.

We are aware that calcification ordinarily occurs rather readily in the rabbit, but similar investigations by Wilkie,[1] in which he performed the same operative procedure on rabbits, except that he did not ligate the cystic artery, were not productive of calcification of the wall of the gall bladder. The production of calcification was not the primary purpose of his work, however, and may have passed unnoticed. Other observers also have ligated the cystic duct and artery in rabbits, usually in the course of experimental studies on the formation of the gall stones, and in no instance have these investigators reported calcification of the gall-bladder wall.

In the attempt to explain the cause of calcification of the gall bladder on the basis of the pathology seen in these experimental animals one is confronted with three phenomena, all of which have been advanced in the past as theoretical causative factors. In both gall bladders there was evidence of chronic inflammation, rather extensive hemorrhage, and of course in both the cystic duct was obstructed. It has been suggested by Davis[2] that hemorrhage into the gall-bladder walls may mobilize calcium salts and that these are deposited within the wall. Other writers have believed that calcification results from inflammation, either in the form of a diffuse process or as localized abscesses in the gall-bladder wall. Drury[3] and others have found that when the cystic duct is obstructed calcium is gradually removed from the retained bile, and this might suggest another explanation, since in nearly all of the clinical cases and in the experimental cases the cystic duct was obstructed. However, the amount of calcium which could be extracted from a small amount of bile would be insignificant compared to the amount of calcium seen in the gall-bladder wall of these cases.

SUMMARY AND CONCLUSIONS

1. An analytical study of the clinical and pathological data available on all the cases of calcified gall bladder reported in the literature has been made, and 3 additional cases with clinical and pathological studies are reported.

2. Calcification of the gall bladder occurs nearly always in women over fifty. It frequently produces no symptoms, since in less than half the cases was there a history suggesting antecedent gall-bladder disease.

3. A calcified gall bladder presents a rather striking *x*-ray appearance, which may be one of three types: (1) mottled, opaque, irregular shadows scattered over the gall bladder; (2) a diffuse shadow, of even density; (3) a ring-like shadow.

4. The operation of choice, cholecystectomy, can apparently be done with no particular increase in risk over that in the ordinary type of chronic cholecystitis.

5. The calcified gall bladder is usually larger than normal, but may be contracted. Its walls feel extremely hard, and when cut there is the characteristic grating on the knife produced by calcium. The cystic duct is usually obstructed by a stone in the gall bladder or in the cystic duct.

6. The lumen of the gall bladder usually contains thickly packed, cholesterin-bile-pigment stones embedded in a calcium paste or mortar.

7. Microscopically the gall-bladder wall usually shows loss of the mucous membrane, fibrosis, lymphocytic infiltration and calcium deposits in the mucosa and submucosa.

8. We were able to produce calcification of the gall bladder in rabbits by cutting off the blood supply of the gall bladder, separating the gall bladder from the liver, and ligating the cystic duct.

9. We believe that the important factors in the production of calcification of the gall bladder are diminished blood supply

and cystic duct obstruction. Both of these factors are, in turn, the result of chronic inflammation and gallstone formation.

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* Continued from p. 116.

OMENTOPEXY IN THE TREATMENT OF CIRRHOSIS OF THE LIVER

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HONOLULU, T. H.

THE medical treatment of cirrhosis of the liver is most discouraging. Of 112 cases carefully selected by Chapman, Snell and Rowntree[1] as being most suitable for medical treatment out of a series of more than 300 cases diagnosed as portal cirrhosis, 54 per cent of the patients had died in sixteen months after onset of ascites, and 75 per cent at the end of six years. They state:

> Our experience in the treatment of decompensated portal cirrhosis indicates if cases are carefully selected about 50 per cent of the patients will make good response to the treatment described and will receive marked symptomatic benefit from its use. The end results are not so satisfactory.

Viewed either from the medical or surgical standpoint one of the chief difficulties in the treatment of this condition lies in the fact that the diagnosis is rarely arrived at before portal decompensation has taken place as evidenced by abdominal ascites or gastric hemorrhages. In an analysis of 245 cases of portal cirrhosis by McCarthy[2] as found at routine postmortem examination of 11,912 adults he found 64.4 per cent were active as revealed by clinical history and examination, and 35.5 per cent latent or not productive of clinical evidence. As was to be expected the pathological development in the latent cases was less advanced than in the active cases.

Since 1889 when Talma first suggested the possibility of benefit from omentopexy in cirrhosis of the liver, and Morrison some six years later performed the first successful operation it has been the observation of many that the development of adequate collateral circulation between the portal and systemic venous systems is the most worthy therapeutic approach to be considered in the treatment of this condition. That spontaneous development of normally existing anastomosis between these two systems may take place sufficiently to relieve portal congestion and prevent clinical symptoms undoubtedly occurs and no doubt accounts for the latent cases found at autopsy and for most cases recovering under medical treatment. The accompanying diagram illustrates the anastomosis most commonly found, though individual variations occur with each case. Also is shown the anastomosis that forms between the vessels of the omentum and the epigastric vessels when the former is implanted into the abdominal wall. Kegaries[3] of the Mayo Clinic has recently reported on the venous plexus of the esophagus and its clinical significance. He found even in the absence of portal obstruction conclusive evidence of a channel of anastomosis between the portal and caval circulation at the cardio-esophageal juncture. Also he confirmed the results of other workers of a connection between the splenic and esophageal veins by way of the veins that accompany the vasa brevia and the coronary veins. The clinical significance of these findings is that in cirrhosis of the liver back pressure on the coronary vein may occur and be transmitted sufficiently to the cardioesophageal veins to result in varices and hematemesis on their rupture. Successful ligation of the coronary vein in the treatment of this condition has been reported by Rowntree, Walters and

McIndoe.[4] They point out that where back pressure from the spleen is also encountered ligation of the coronary vein alone may not be sufficient, but in addition either ligation of the vasa brevia or splenectomy may have to be done.

From a perusal of the available literature for the past ten years and from personal conversation with men at various mainland clinics over the same period of time it is apparent to me that the operative treatment of cirrhosis of the liver, aside from paracentesis for relief of symptoms, is a procedure not held in very high esteem by most observers.

Eliot and Colp[5] from their experiences concluded that omentopexy in cirrhosis of the liver is of benefit in carefully selected cases.

Gibbon and Flick[6] state:

> One is struck in reviewing the literature with the fact that some cases are apparently cured while others, the greater number, are not benefited at all. It was with the hope of trying to arrive at some explanation of this fact that we took up the study of our own cases, ten in number. While our results have not been strikingly good they have been good enough to make us feel that the operation of epiplopexy is a useful one, one which we can expect to result in cure in probably 10 per cent of the cases and in benefit to a much larger percentage.

William J. Mayo[7] divides cirrhosis of the liver into two fairly definite groups: First, portal cirrhosis the result of deposits of connective tissue around the radicles of the portal vein causing ascites and hemorrhages from the stomach, and second, biliary cirrhosis the result of deposits of connective tissue around the biliary duct system causing chronic jaundice. In the former he concludes that splenectomy and the Talma-Morison operation combined may have value, though pointing out the added operative risk of removing the spleen and advising estimating the functional capacity of the liver beforehand. In the secondary splenic type of portal cirrhosis occurring in the late stages of splenic anemia splenectomy gave splendid results. Biliary cirrhosis he found to be the result of obstruction and infection of the biliary ducts usually from gallstones, and in cases not too far advanced proper operative procedures on the biliary ducts gave relief. Biliary cirrhosis is not the type of cirrhosis being discussed in this paper.

Though my experience has necessarily been limited, the outcome in most instances where surgery has been used in cirrhosis of the liver has been gratifying, so much so that a reconsideration of the subject seems worth while.

In the surgical treatment of the condition under discussion one has at his disposal three procedures that may prove of value. First and most important the increasing of anastomosis between the portal and systemic circulation, so that blood returning from the abdominal viscera will be shunted around the atrophic liver thus preventing portal congestion with resulting abdominal ascites, and other clinical manifestations. Implanting the omentum into the abdominal wall by the method previously described by others is the procedure of choice, though some have advised roughing the surface of the liver, spleen and other visceral organs. This is productive of considerable shock and is of doubtful value. Second, decreasing the volume of blood passing through the portal system. It has been estimated that from 25 to 35 per cent of the portal blood passes through the spleen, therefore removal of this organ decidedly lessens the mount of collateral circulation necessary to take care of the portal congestion. And third, the ligation of veins to decrease varices as previously indicated.

The technique of omentopexy is comparatively simple and relatively devoid of operative shock if the patient's condition has not become too debilitated. A right or left rectus incision alongside and above the umbilicus is made, through which exploration of the liver or other abdominal viscera is carried out. Any interference with circulation in the round ligament, such as may occur from transverse incision, is to

be avoided as on several occasions immense dilatation of its veins has been observed and was undoubtedly serving a most useful purpose in attempting to offset portal obstruction. If a larger area for contact with the omentum seems desirable than may be procured under one rectus muscle, the rectus sheath of the opposite side may be opened and the omentum tacked beneath this muscle. The omentum is drawn out and as much as possible, spread about between the posterior surface of the rectus muscle and fascia and sutured in place. The posterior rectus fascia is then sutured snugly, but not sufficiently tightly to constrict circulation, about the pedicle of the omentum.

Following operation, during which time the establishment of collateral circulation is taking place, reaccumulation of fluid may occur and aspiration become necessary. One case, postoperatively, required seven aspirations over a period of five months, and another twelve during three months. A careful closure of the structures of the abdominal wall is necessary in order to prevent the possibility of subsequent incisional hernia developing. This occurred in one individual in which infection of the abdominal wall took place.

In the cases here presented an exact pathological differentiation into the various types of cirrhosis, so frequently made by various writers on the subject, has not been attempted. To me such classifications usually lack any definite line of demarcation, and are probably of more scientific interest than practical value. In the differential diagnosis one may occasionally be in doubt as to whether the condition is cirrhosis of the liver, tuberculosis involving the peritoneum, or malignancy. An exploratory incision should be used in such a dilemma.

REPORT OF CASES

Case 1. Queen's Hosp. No. 30,797. Male, aged thirty-six. Entered the hosp. February 5, 1925.

Operation February 6, 1925. Discharged February 23, 1925.

History of syphilis in 1912. Inadequate treatment. Wassermann reaction in December 1924, 4 plus. Enlarged nodular liver and enlarged spleen. History of gastric hemorrhages for the past year. Given more antiluetic treatment followed by severe hemorrhages, tapped 6 times and given several blood transfusions between December 15 and February 6, 1925 at which time omentopexy was done. At operation liver was shrunken, hobnail, spleen enlarged. Following operation he was aspirated, at lengthening intervals, seven times, the last on July 18, 1925. From this time on improvement was steady and continuous, without antiluetic treatment which he refused. In July, 1929 he came for examination stating he felt well, and was working daily as an electrician. The liver was not palpable, the spleen two and one-half fingerbreadths below the costal margin. There was some free fluid in the abdomen. Radiating upward and downward from the sight of the omentopexy there were visible, enormously dilated veins. He was seen a short time ago and stated his abdomen had caused him no further trouble, though he still has an easily palpable mass in the splenic area. He has had two small gastric hemorrhages during the past year. Perhaps ligation of the coronary vein or the short gastric veins would be of value for the control of these hemorrhages.

Case 11. Queen's Hosp. No. 70,702. Japanese male, aged fifty-two. Entered the hospital October 20, 1931.

Operation October 21, 1931. Discharged November 7, 1931. Onset one month previous to hospital admission with vomiting of blood, collapse and delirium lasting two days. Transfused at this time. One week later abdominal ascites developed, and palpable spleen first noted. Has been heavy drinker for many years. Previous to operation abdomen tapped twice, 4 liters of straw-colored fluid removed each time. Hgb. 50 per cent, R.B.C. 2,800,000, leucocytes 4000, polymorphonuclears 70 per cent, small lymphocytes 28 per cent. Given 500 c.c. citrated blood twice preoperatively.

At operation, under spinal anesthesia through left rectus incision, abdomen found to contain fair amount of straw-colored fluid. Liver small, atrophic hobnail. Spleen enlarged to probably three times normal size. Abdomen otherwise negative. Veins of round ligament

greatly dilated. Omentopexy. Patient made a good immediate recovery. He has been given intensive antiluetic treatment, and two years

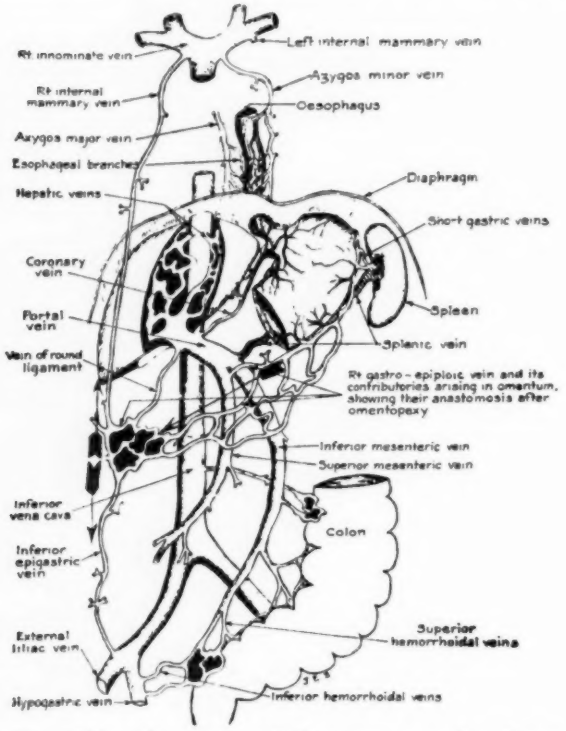

Fig. 1. Normal anastomosis between portal and systemic circulation, and that produced by omentopexy.

postoperative (November 29, 1933) the Wassermann reaction was 1 plus. On December 24, 1932 there was a return of ascites and 3 liters of fluid were removed. At the time of operation an enlarged spleen was noted but it did not seem advisable and perhaps unnecessary to remove it. On June 6, 1934 the patient returned with reaccumulation of abdominal fluid and 3000 c.c. were removed. On June 18, 1934, 1800 c.c. were aspirated. The hemoglobin at this time was 40 per cent, and red cell count 2,400,000. He was given three transfusions, two previous to, and one during operation, and the spleen which weighed 820 gm. was removed on June 25, 1934. More omentum was also implanted into the abdominal wall. It is one month postoperative now and no fluid has reaccumulated, and the patient looks and feels better than at any time since being under my care.

The accompanying photograph (Fig. 1) shows the enlargement of the inferior mesenteric veins since the omentopexy, and previous to the splenectomy.

Case III. Queen's Hosp. No. 67,337. Chinese male, aged thirty-one. Entered the hospital May 6, 1931. Operation August 7, 1931. Discharged August 15, 1931 (to convalescent home).

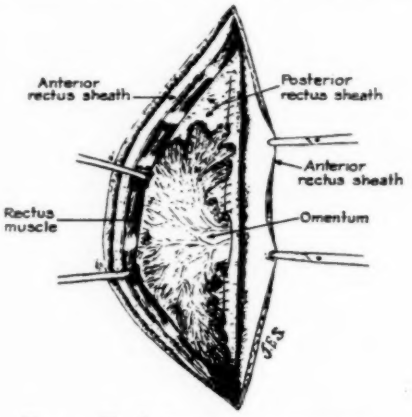

Fig. 2. Technique of omentopexy.

Patient had been admitted to the hospital first in January, 1929 and several times subsequently at which times a diagnosis was made of chronic parenchymatous nephritis. The urine had constantly shown marked albumin, hyalin and granular casts, and the blood chemistry a high non-protein nitrogen, urea and creatinine. Three weeks previous to present admission he vomited bright red blood. A week later the abdomen began to swell. No history of alcoholism. Examination of abdomen showed much free fluid. After aspiration of 3700 c.c. fluid definite enlargement of spleen felt extending 3 fingerbreadths below costal margin. Liver not palpable. R.B.C. 2,700,000, Hgb. 45 per cent, W.B.C. 3700, polynuclear leucocytes 70 per cent, small lymphocytes 26 per cent, large lymphocytes 2 per cent, eosinophiles 2 per cent. *X*-ray chest negative. Urine: trace albumin, otherwise negative. Stool negative. Wassermann and Kahn reaction negative. Aspirated fluid straw colored. Sp.G. 1.004. Smear, few lymphocytes. Blood pressure 114/60. Patient in very poor condition. Edema of scrotum and legs. Given two transfusions Operation May 22, 1931, spinal anesthesia. Small, atrophic, hobnail liver. Spleen removed. Enlarged (wt. 727 gm.). Omentopexy. Microscopic section of spleen showed marked inflammatory reaction with increase in connective tissue.

This patient's postoperative recovery has been most spectacular. The last aspiration was on August 14, 1931. When last seen (January 26, 1934) two years and eight months after

operation, he was feeling well, had returned to work, there was no sign of abdominal fluid. The inferior epigastric veins were markedly dilated and tortuous. The urine was free of albumin and there were no casts. Hgb. 72 per cent, R.B.C. 4,350,000, W.B.C. 9800, polynuclear leucocytes 36 per cent, small lymphocytes 58 per cent, platelet count 230,000, large lymphocytes 2 per cent, transitional 9 per cent, eosinophiles 2 per cent, mast cells 3 per cent.

Dates of aspirations:

Preop.—May 7, 1931—3700 c.c.
May 13, 1931—2900 c.c.
May 20, 1931—1550 c.c.
Postop.—June 4, 1931—900 c.c.
June 15, 1931—3750 c.c.
June 18, 1931—3750 c.c.
June 26, 1931—3950 c.c.
July 3, 1931—4000 c.c.
July 9, 1931—4000 c.c.
July 15, 1931—3000 c.c.
July 20, 1931—3300 c.c.
July 25, 1931—1000 c.c.
July 31, 1931—3200 c.c.
August 7, 1931—4000 c.c.
August 14, 1931—4000 c.c.

Case IV. Queen's Hosp. No. 44,315. Japanese female, aged thirty-four. Entered the hospital September 28, 1927. Operation September 30, 1927. Discharged October 14, 1927.

History of gradually enlarging abdomen with palpable mass in splenic region of six months' duration. General physical examination negative. Abdomen distended, containing much free fluid, with spleen 3 fingerbreadths below costal margin. W.B.C. 2400, polynuclear leucocytes 68 per cent, small lymphocytes 24 per cent, large lymphocytes 4 per cent, eosinophiles 4 per cent. R.B.C. 3,600,000. Hgb. 50 per cent. Wassermann reaction negative. The icterus index was 2, and the serum bilirubin test was negative. Blood pressure 130/80. Urine negative. At operation the abdomen was found filled with straw-colored fluid, the liver was small and atrophied, but not markedly so, the spleen was enlarged. The spleen was removed without difficulty, followed by omentopexy. Weight of spleen 523 gm. (three times normal). Microscopic section showed marked fibrosis, Malpighian bodies atrophied. The patient made an uneventful recovery and required no postoperative tapping, though the fluid reaccumulated to a considerable degree for two months then disappeared. When last examined on January 3, 1934 (six years after operation) she was in excellent health. She had given birth to three normal children since operation

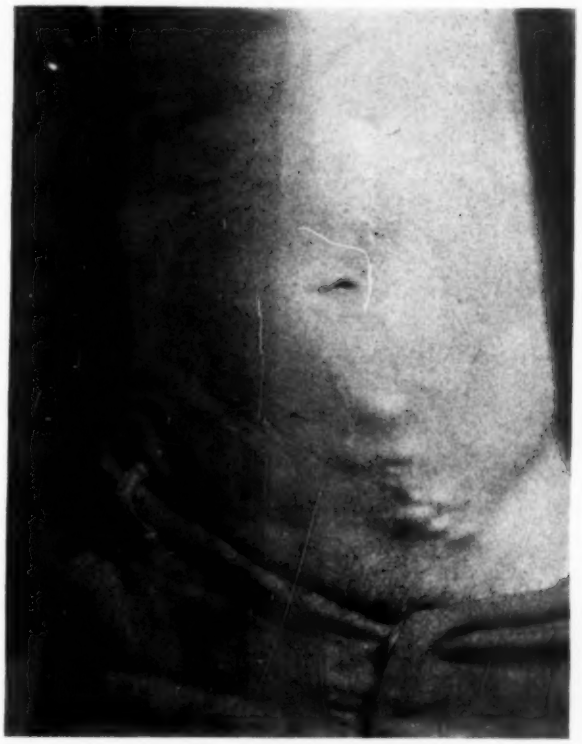

Fig. 3. Showing dilated inferior epigastric veins after omentopexy.

and there was no sign of abdominal fluid. The veins in the abdominal wall were not enlarged.

The two foregoing cases may come under the classification of splenic anemia or Banti's disease and possibly would have recovered by splenectomy alone. In Cases I and V the patients also had enlarged spleens which were not removed, and they also recovered, or at least showed great clinical improvement. Examination of the abdominal walls now show marked enlargement of the epigastric vein in Cases I, II, III and V, but not IV.

Just what reliable criteria one may depend upon in determining when to remove an enlarged spleen in the presence of cirrhosis of the liver has not been determined. One is usually dealing with a debilitated individual and adding splenectomy to omentopexy converts a fairly simple procedure into one of considerable magnitude. Removal of the spleen un-

doubtedly relieves the portal circulation of a considerable volume of blood and in cases of splenic anemia evidently has a specific action on the course of the disease.

Case v. Queen's Hosp. No. 79,877. American male, aged forty-six. Entered the hospital April 25, 1933. Operation April 29, 1933. Discharged June 6, 1933 (to convalescent home).

Enlarging abdomen for two months with distress. Jaundice for past two weeks, with itchiness of skin. Enlarged nodular liver extending to umbilicus, enlarged spleen extending 4 fingerbreadths below costal margin, abdominal fluid. Wassermann and Kahn reactions negative. R.B.C. 4,280,000, Hgb. 80 per cent, W.B.C. 4100, polynuclear leucocytes 71 per cent, small lymphocytes 23 per cent. Urine negative except trace of albumin. Non-protein nitrogen 28.5 mg. per 100 c.c. blood. Blood sugar 100 mg. per 100 c.c. blood. van den Bergh's test, direct reaction positive, 57.75 mg. bilirubin per liter. Blood pressure 124/60. *X*-ray of chest negative.

April 26, abdomen aspirated and 4900 c.c. of straw-colored fluid removed. Specific gravity 1014. Heavy albumin, bile negative. Preoperative diagnosis, probably carcinoma involving liver, possible cirrhosis of the liver. Exploration April 29, 1933 under local anesthesia showed enlarged nodular liver with cirrhotic changes producing hobnail appearance. No evidence of malignancy seen. Omentopexy done.

Postoperative course: Some infection of the abdominal wall occurred and an incisional hernia has developed. May 14, 1933, 1000 c.c. straw-colored fluid aspirated. May 27, 1933 van den Bergh's test 31.5 mg. bilirubin per liter of blood. June 6, 1933 sent to convalescent home much improved. Since this time he has had no further medical treatment, is able to be about and would return to light work if job were available.

Case vi. Queen's Hosp. No. 83,094. Chinese, male, aged thirty-seven. Entered the hospital December 6, 1933. Operation December 13, 1933. Discharged December 29, 1933 (to convalescent home).

History of swollen abdomen for one and one-half weeks. No other symptoms except slight abdominal discomfort after heavy meal. Occasional user of alcohol. Examination, except for abdominal ascites, negative. Liver and spleen not palpable. Wassermann and Kahn reactions negative. Urine negative. Hgb. 80 per cent. R.B.C. 4,100,000, W.B.C. 4100, polymorphonuclears 52 per cent, small lymphocytes 43 per cent, large lymphocytes 3 per cent, eosinophiles 2 per cent. *X*-ray of chest negative. December 8, 1933, 1500 c.c. of straw-colored fluid aspirated from abdomen. Sp. G. 1011, slightly alkaline. Smear showed few lymphocytes. At operation, a considerable amount of straw-colored fluid in abdomen. Liver small, showed typical changes of cirrhosis. Omentopexy. Uneventful postoperative recovery. Patient seen February 3, 1934. No reaccumulation of abdominal fluid, veins in abdominal wall above and below region of omentopexy becoming distinctly dilated. Would like to return to work if job available.

Case vii. Queen's Hosp. No. 69,165. Chinese, male, aged seventy. Entered the hospital August 3, 1931. Operation August 7, 1931. Discharged August 31, 1931.

Came under observation on August 3, 1931 with history of pain over gall-bladder region of several days' duration. There was tenderness and muscle spasm in right upper quadrant. No abdominal masses or fluid made out. The temperature was 99.6°F., W.B.C. 5600, urine negative. Gall-bladder visualization showed a faint shadow with poor emptying, suggestive to the roentgenologist of possible gall-bladder disease. The pain became more severe and exploration seemed justified with a preoperative diagnosis of gallstone colic.

At operation under spinal anesthesia the liver was found to be markedly atrophic and hobnail in character. There was some free fluid in the abdominal cavity. The gall bladder looked and felt normal. The stomach, pancreas and other adjacent organs appeared to be normal. An omentopexy was done.

The patient made an uneventful recovery and was not seen again after leaving the hospital. When attempting to trace the outcome of this patient in preparation for this paper it was learned that he had died about one year following operation, and the cause of death as given by another physician was carcinoma of stomach and liver. Whether this diagnosis was correct, or whether he died from portal decompensation I have not been able to determine.

Case VIII. Queen's Hosp. No. 49,924. P. H., aged thirty-three. Entered the hospital October 2, 1928. Operation October 17, 1928. Died October 26, 1928.

During past year frequent removal of abdominal fluid up to 8 liters. On admission to hospital emaciated, abdomen distended with fluid, liver not enlarged. Spleen palpable. Operation under local anesthesia showed marked atrophy, hobnail liver with splenic enlargement. Omentopexy. Patient did well until eighth day. Developed hiccough, became weaker and expired on 10th postoperative day. Autopsy showed omentum in place, healing well, small amount of peritoneal fluid, atrophic liver, hypertrophic spleen. Death was attributed to hepatic toxicosis.

CONCLUSION

These case reports cover the experience I have had, both good and bad, with the surgical treatment of cirrhosis of the liver. Though the cases have been few and the lapse of time in some instances too short to draw final conclusions, the results have been most encouraging. Even in advanced stages of portal decompensation an omentopexy can be done with a minimum degree of shock in properly prepared patients. With patience, and at times prolonged postoperative care, one may hope even expect not only to relieve the patient of his clinical symptoms, but probably enable him to return to a useful occupation. With the possible exception of splenectomy in certain selected cases, or more rarely the ligation of veins to control varices, the development of adequate anastomosis between the portal and systemic circulation, is the only therapeutic approach worthy of serious consideration in the treatment of cirrhosis of the liver.

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ACUTE DIVERTICULITIS OF THE SIGMOID

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FARGO, N. D.

ACUTE perforative diverticulitis of the sigmoid is rare, but records found in studying the literature of diverticulitis show that when operative measures were used, the method most often employed was abdominal section, closure of the perforation when possible, and drainage.

That this method of treatment is not without serious drawbacks and that safer and better methods of drainage can be used are both illustrated in the histories of the following cases:

CASE I. No. 16407. Mrs. M. L. P., aged seventy-one, stated that her trouble began six weeks ago with attacks of abdominal pain, gaseous distention and vomiting. There was obstipation. Two weeks ago pain in the rectum began and her bowels became very frequent, often of clear mucus, but no blood. She had run a low fever.

Her abdomen was tender in the left lower quadrant where a mass could be felt. Rectal examination revealed a hard, very tender area low on the anterior wall, and the pelvis was filled with fluid. On proctoscopic examination the indurated area looked inflammatory.

With spinal anesthesia, a biopsy from the anterior rectal wall was obtained and hemostatic forceps thrust through the biopsy wound and rectal wall evacuated a large pelvic abscess. A winged tube was inserted through the rectal wall into the pelvic cavity. The biopsy report was inflammation of rectal wall.

Two days later she relished her breakfast and went on to a rapid recovery.

CASE II. No. 14600. Mr. J. W., heavily built farmer, age forty-one years, stated that he had discomfort at times in the lower abdomen for the past two or three years, lately more on the left side. For a still longer period he had had two or three loose movements in the morning and occasionally one in the afternoon. He had an achylia for which dilute hydrochloric acid was prescribed. He felt well for two months. He entered the hospital with the statement that for three days he had suffered acute abdominal pain slightly below the navel.

He was tender in the right lower quadrant with moderate muscle spasm; temperature, 101°F.; pulse, 93; white blood count, 16,000.

The diagnosis was acute abdomen caused by appendicitis or diverticulitis and an immediate operation was done. A large white appendix was removed, obviously not the cause of the illness. In the lower sigmoid was a plum-sized, hard area with the fatty tags adherent to the bowel, which was diagnosed acute diverticulitis. No perforation was found and the abdomen was closed. His symptoms quieted down, and the temperature went to normal at the end of the third day. Then he became worse, undoubtedly due to a perforation and low fever began. Two stitches were removed, and foul-smelling pus began discharging from this part of the wound.

On rectal examination an induration of the bowel was felt and the cul-de-sac in front of the rectum was tense. Two days later, an incision was made through the anterior wall of the rectum and into the pelvis. A few ounces of foul pus were evacuated. A winged tube was made and inserted into the pelvic cavity through the rectal opening. All symptoms improved, and he went on to recovery.

Two months later he entered the hospital at night with intestinal obstruction. This was found to be caused by an ileal kink due to adhesions. These were freed. The region of the sigmoid was explored, and a slight thickening and some adhesions found at the site of his former trouble.

There are several facts that may be learned from this history. The past history of discomfort, gas, and loose bowels over

an extended period is in itself suspicious of diverticulitis. In his later history the discomfort was more on the left side.

The attack of acute diverticulitis resembles in a marked degree the attack of appendicitis. In this patient, with such a characteristic history of acute sigmoidal diverticulitis, a correct diagnosis could, I believe, have been made; conservative measures could have been used until perforation had taken place and the pelvic accumulation of pus had formed, and then a drainage tube through the anterior rectal wall installed.

I have reviewed much of the literature on diverticulitis, discussed the subject with surgeons who have had large experience with the disease, but have failed to find that this method of drainage through the anterior rectal wall has been used.

Dr. Archibald MacLaren[1] has published two papers on the subject. According to Dr. MacLaren, this method was not original with him, but, so far as I know, his descriptions are the first in American literature. A self-retaining or winged tube is fashioned from ½ inch rubber tubing, by the method described by Warbasse.[2] The patient, whose colon has been carefully cleaned out, is given novocaine solution through the sacral hiatus or gas anesthesia is produced. He is put into the lithotomy position, the sphincter dilated, and the anterior and posterior retractors inserted. The tense, bulging rectum above the prostate is identified, curved scissors cut a small hole through the anterior rectal wall and the hole is stretched by scissor blades. The pus runs out and the winged tube is inserted with forceps. The lower end projects through the anus.

Nearly all surgeons recoil from deliberately making an incision through the rectal wall. Their experiences with lacerations of the colon and the dreadful complications which follow, make them do so. Hence, they prefer to make an abdominal section and drain from above, producing a spreading of the inflammation by their

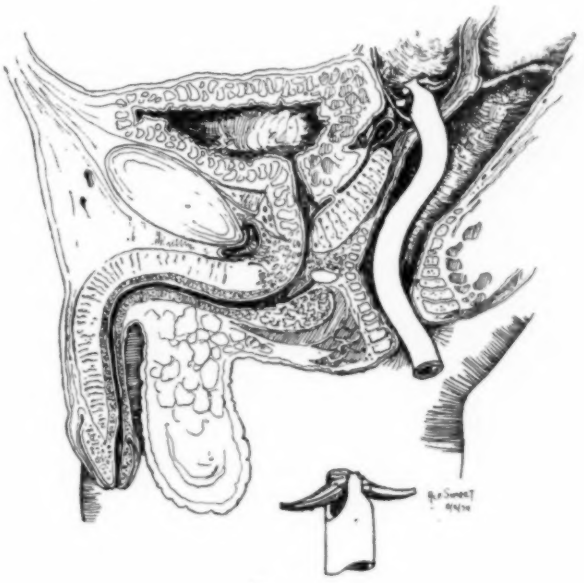

Fig. 1.

method. I am certain that there is a vast difference between the effects of a laceration on an unprepared colon and the low incision through the empty rectum into the pelvic abscess. Since the publication of MacLaren's report on rectal drainage we have used his method for pelvic abscesses of appendicial origin probably twenty times. I have never seen any ill effects follow the use of this method, while the immediate improvement of the patient proves its great worth.

The main difference between the late pelvic abscess from appendicitis and that due to sigmoidal diverticulitis is that the latter is often smaller. The treatment is the same except drainage is likely to be longer in diverticulitis. I believe that if this method had been used some of the tragic endings so often cited in the literature would have been avoided.

Just as after rupture of an appendix, fecal fistula sometimes follows ruptured sigmoidal diverticulitis. A fecal fistula following vaginal drainage would be a very unfortunate complication. For this reason the rectal approach to an abscess caused

[1] Pelvic abscesses with special attention to rectal drainage. *Surg. Gynec. Obst.* (June) 1908, *J. A. M. A.* (June 25), 1910.

[2] Surgical Treatment. Vol. 1, p. 46.

by diverticulitis may be preferable in women as well as in men.

Another form of rectal drainage, which I have not found described in the literature, was used in the following case:

Case III. No. 2792. A. L. M., well-nourished man, aged seventy-one, whose illness started with diarrhea. A few days after the onset, he had a chill accompanied by slight discomfort in the left lower abdomen. A few days later a mass could be felt extending from just above the prostate upwards and to the left. This mass could also be felt through the abdominal wall. Continuous irregular fever set in. Gradually this grew worse and chills with heavy sweats developed. At the same time the discomfort increased.

Under gas anesthesia an attempt was made to drain the diverticulitis through the anterior rectal wall. One week later, as no improvement followed, a second attempt was made. As the diverticulitis mass was low down, this time an opening was made through the rectal mucosa directly into the lower part of the mass. With forceps and finger, blunt dissection was carried upwards between the layers of the greatly thickened rectal wall until a softened area was reached; Penrose drains were inserted into this necrotic center. The temperature went down; no further chills and sweats followed; and pus discharged freely into the rectum for many days. There was no further serious illness and he went on to recovery.

CONCLUSIONS

Acute diverticulitis closely resembles acute appendicitis. Differentiation and correct diagnosis will be more often made if due consideration is given to the complete history of the case and to the rectal examination. If fluid can be felt in the pelvis, drainage through the anterior rectal wall for acute perforated sigmoidal diverticulitis is far the better method of drainage. This method has not received the attention that it deserves in the appendix cases, and seems to be unknown in the diverticulitis.

A diverticulitis causing septic symptoms, which on rectal examination can easily be felt on the anterior wall, may be drained directly into the rectum without entering the pelvic cavity.

A SIMPLE EXPEDIENT FOR THE TREATMENT OF

ACUTE & CHRONIC SYNOVITIS OF THE KNEE JOINT FOLLOWING TRAUMA

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CHICAGO

I AM not going into the previous history of the treatment of this condition as many have written on the subject. We believe the reader is not interested in it from that standpoint, hence I will describe the method we use in this office without digressing.

In the many cases treated in our office we have had to deal with the problem as to how to treat patients and at the same time permit them to remain at work. We have been able to do this by our method.

We first studied the anatomy of the knee joint to determine the extent and outline of the synovia in its relation to the knee joint. It was interesting to find that this synovia extends anywhere from 4 to 6 inches above the upper border of the patella, on the anterior surface of the leg, this being determined by numerous operations on the knee joint.

We carried out many different types of treatment without obtaining the benefits we now derive by our present method. From the beginning of the handling of the case, whether acute or chronic, we carry out a routine type of treatment which seems to be equally efficient in both the acute and chronic forms of traumatic synovitis.

TREATMENT

We procure, in quantities, the porous rubber bath sponges which cost very little. The sponge is shown in Figure 1.

We cut, or bivalve, this sponge longitudinally as shown to fit the contour of the synovia and extend up above the patella and cover the entire synovial extension. It is not necessary to place any rubber over the patella but only on the sides and above, as shown in Figures 2 and 3.

It is necessary to place a pad of gauze-wrapped cotton along the posterior aspect of the knee, then a circular dressing of sheet wadding (Fig. 4). The rubber sponge pads are then placed over this. A circular gauze bandage is then applied over the entire structure, compressing the sponges firmly. We re-inforce the outside by a series of adhesive straps as shown (Fig. 5).

One might be of the impression that such a tight dressing would interfere with the return circulation of the leg; it never does because after the application of this dressing with its protective popliteal pad, the patient is instructed to walk immediately, without crutches. In the event he follows instructions, contrary to our previous conceptions, we find that the swelling in the synovia gradually disappears, the continual compression effect of the sponge rubber meeting by its elastic expansion the gradual absorption of fluid within the capsule; and the normal activation of the limb preventing edema of the lower extremity. This type of dressing has to be changed every four to seven days; in the meantime most patients can keep on with their work.

In the acute type it usually takes three to six weeks to accomplish results. In the chronic type, coming under this method of treatment, after a delay, a somewhat longer time is required (see the following case reports).

After checking over cases there is no doubt in our minds but we accomplish the following desiderata:

Fig. 1.

1. Little or no interference in continuing at their work.
2. No later treatment for edema of the distal extremity.
3. No changes within the knee joint such as arthritis, hydrops, fibrosis, osteal or capsular atrophy or adhesions.
4. No fibrosis resulting in a partially or completely stiff knee joint.
5. The patient is more amenable to this type of treatment, preferring it to cast, crutches or bed confinement.
6. Incidentally, from a social and industrial standpoint, a matter of economy to the private patient and the industry involved.
7. The aspiration of fluid from the joint is unnecessary.
8. The activation of the joint while under treatment does not produce any disabling amount of discomfort to the patient.

Occasionally after sponge treatment is completed one can apply an elastic knee cap to be worn for a few weeks to be on the safe or conservative side, in preventing recurrence of synovial effusion and giving the patient a comforting sense of support.

We realize this is a radical departure from the usual methods but we have been using it now for some five years with eminent success before presenting it to the medical profession.

Fig. 2.

Fig. 3.

Following are points of interest which developed during course of treatment of some cases actually treated by this method:

1. We have treated even cases of patella fracture in this way, when the fracture was entirely intracapsular, longitudinal in type, not accompanied by any tearing of the capsule; but accompanied by a varying degree of synovial effusion; in other words where the fracture was the minor feature and the synovitis was the important pathological feature.
2. It is important to use sponges of fresh lively rubber, and as sponges in use lose their elasticity, replace them by fresh sponges.
3. The sponge-type dressings stay snugly fitting on the knee for four to five days, we find instead of slipping down the leg as the usual inelastic dressing used to do when the knee swelling subsided a little: because as the swelling of synovia is pressed out, the compressed sponges expand and keep up a continual pressure on the joint.

4. The pressure of the dressing must be carefully regulated to the particular patient and limb, because if too tightly applied or without enough padding over the popliteal vessels, it can cause some discomfort and edema distal to the dressing.

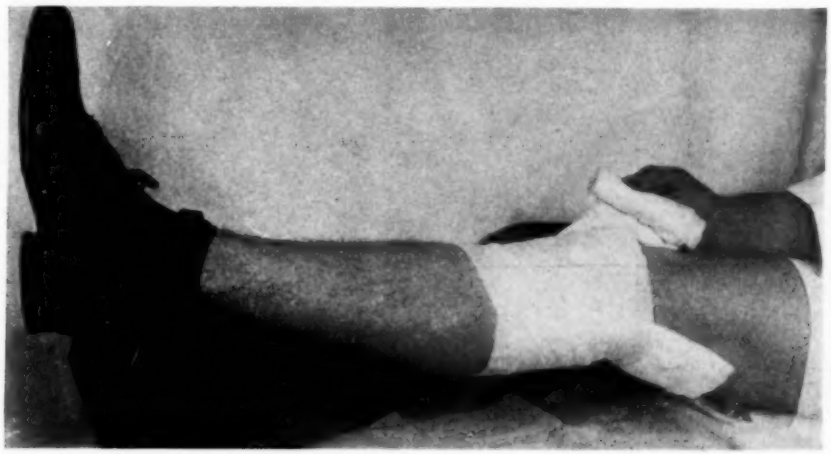

Fig. 4.

5. In patients with a tender skin, we bathe the skin first with alcohol, dry and rub with talcum powder and apply the popliteal cotton pad, sheet wadding or cotton circular and bivalved sponges.

6. Patients are cautioned not to keep the knee flexed too long at a time, as this tightens the dressing too much and it "cuts in" behind the knee.

7. We have been able to shorten by a half, the period of knee swelling by this method as compared with non-compression methods, and have found that casts are not necessary, nor splint immobilization of the joint, nor aspiration (once or repeatedly).

8. We have used similar sponge pressure adapted to other traumatic conditions (such as bursae of elbow and knee), but have confined this paper to the use of sponges in treatment of knee joint effusions.

9. By experience we have found that even with a firm sponge pressure on the knee, the joint can be flexed at least 60 degrees, which is a sufficient range to suit most occupations.

10. This sponge dressing is comfortable when applied over the minor wounds or abrasions which often accompany the acute traumatic synovitis. Of course, such surface lesions should be treated in the usual antiseptic and aseptic manner before applying the outer sponge dressing.

Case 1. A. K. White male, married, fifty-six years of age, laborer.

On February 13, 1934 while working he fell and twisted his right knee. A few hours later knee began to swell and pain him. He came under our observation February 17, 1934 when the measurements of the knee were: right 16¼ inches, left 15¼ inches.

X-rays at this date were negative and diagnosis made of traumatic synovitis. Sponge pressure dressings were applied.

On March 9, 1934 comparative measurements of both knee showed no swelling, both measuring 15¾ inches and both calves 14¾ inches. The sponge pressure dressing was discontinued and heat and massage treatments started.

On March 23, 1934, five weeks after injury, he was discharged having no loss of function and no complaints.

He has lost three weeks from work.

Case 11. L. C. White male, single, nineteen years of age, salesman.

On July 7, 1934 while carrying a carton he fell and injured his knee. The next day the knee became swollen and difficult to flex. Two days later he came under our observation and a diagnosis was made of traumatic synovitis. He was started on sponge pressure dressing treatment.

On July 20, 1934 the swelling was all gone.

The patient stated he felt fine and was discharged two weeks after date of injury. The bandage has not interfered with his work, therefore he lost no time from work.

Fig. 5.

Case III. A. L., white male, married, thirty-six years of age, laborer.

On July 7, 1934 while carrying two cans of paint, he tripped over a piece of canvas, falling on his left knee. A few hours later it began to swell and gave him considerable pain and discomfort. Later he was unable to move leg. He was taken to St. Luke's Hospital and *x*-rays were obtained which revealed a longitudinal fracture with no displacement of the left patella. A plaster cast was applied extending from high on the thigh down to the toes, with the knee in the extended position.

On July 14, 1934 the case came under our observation and after reviewal, the cast was removed and sponge pressure bandage applied over the knee. Three days later the patient was discharged from the hospital, getting about with the aid of crutches.

On August 11, 1934 the swelling was practically gone from the knee. There being no crepitation in the joint and no edema of the ankle, it was decided to leave off the sponge dressings and apply an elastic knee stocking and start heat and massage treatments.

On September 10, 1934 the patient was discharged having no limitation in motion and no swelling of the knee. He was advised that he could then return to his active work.

Case IV. J. H., white, male, thirty years of age, single, houseman in building.

On May 18, 1931, he stumbled over a hose and fell, striking both knees on the sidewalk. Five hours later he was unable to continue with his work because the knee was painful and swollen. The doctor of the building saw him and applied ice to the knee but he seemed to get no relief.

He came under our observation two days later, May 20, 1931, and it was found that in the right knee there were no objective findings. The left knee was extremely swollen, being 15¾ inches in circumference, above the patella, as compared with the right of 13¾ inches. There was considerable fluid, extravasation in the joint with floating of the patella.

X-rays were found to be negative and a diagnosis was made of traumatic synovitis.

Treatment consisted of sponge pressure bandage.

May 29, 1931, most of the swelling from the knee was gone and the patient was comfortable. The sponge pressure dressing was left off and heat and massage treatments started.

June 13, 1931, comparative measurements of both knees above the patella were: right 14½ inches, left 14⅝ inches.

The patient had free painless motion and was accordingly discharged 3½ weeks after injury. He lost three weeks from work.

Case V. O. T. white, male, married.

On June 15, 1931, he caught his left toe in a ladder, getting into an upper berth, started falling and twisted his left knee. The next day the knee was swollen, no locking of knee joint.

X-rays were obtained and were negative for recent bone pathology.

A diagnosis was made of traumatic synovitis and a sponge pressure bandage was applied.

June 22, 1931 the swelling was practically gone, the sponge pressure dressing was left

off and an elastic knee cap stocking was applied; also heat and massage treatments were started.

June 29, 1931 there was no swelling nor tenderness and the patient was discharged having no limitation in motion or specific loss. He has lost no time from work.

Case vi. M. T., white, male, married, thirty-two years of age, stereotype work, weighs 215 lb.

On May 14, 1931 he bumped his left knee against the sharp corner of a casting box; a few hours later the knee began to swell and was painful behind the knee with increasing pain on bending or jerking the limb.

He came under our attention on May 18, 1931, and examination revealed the left knee to be ½ inch larger in circumference than the right, just above the patella. There was an extra amount of fluid in the knee.

X-rays were procured which were negative and a diagnosis made of traumatic synovitis. A sponge pressure bandage about the knee was applied.

June 16, 1931, the swelling was almost gone and heat and massage treatments started. June 22, 1931, five and one-half weeks after date of injury, all of the swelling was gone and the patient was discharged, having no complaints.

He lost five and one-half weeks from work, his condition being complicated by gout setting into the great toes of both feet two and one-half weeks after the injury to his knee.

Case vii. N. P., white, male, thirty-one years of age, married, butcher.

June 10, 1931, while going downstairs with a barrel, his right knee partly bent, he felt a sudden pain or twinge in his knee and it gave way from under him.

Examination revealed his right knee had a definite effusion in the joint amounting to an inch swelling in circumference, some floating of patella being present.

Diagnosis was made of traumatic synovitis with slight strain of the internal lateral ligament.

Treatment of rubber sponge pressure was started.

The patient did not return on the specified date and a check up on our part on July 10, 1931, revealed that he was feeling fine, having no trouble with his knees and did not think it necessary to report, since he felt so well.

He stated he lost no time from work.

Case viii. C. N., white, male, married, twenty-nine years of age, foreman in transit company.

In an automobile accident on August 11, 1931, he received injuries to face and both knees. He injured his knees when he bumped his left knee against the instrument board.

Examination revealed the left knee to be markedly swollen. Comparative measurements showed the left to be 2 inches larger in circumference than the right knee.

A diagnosis was made of traumatic synovitis of the left knee and the sponge pressure bandage applied.

September 10, 1931, all of the swelling was gone and the patient had no complaints to make. He was accordingly discharged four weeks after date of injury.

He had lost no time from work.

I wish to thank my associates, Dr. Stimson, Mason and Zoblocki, as well as my photographer, Charles Hribel, for their assistance in the compilation of this paper.

GIANT CELL TUMOR OF THE PATELLA

A COMPLETE REVIEW OF THE LITERATURE; REPORT OF A CASE*

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GIANT cell tumor, or sarcoma, as it was originally termed, is a not infrequent invader of the skeletal structure. It attacks usually the ends of the long bones, but it can also be found as a primary condition in other localities. A search of the literature reveals only 13 instances in which the patella has been invaded as a primary focus. These, with the author's case, bring the total to 14, a number considerably less than the incidence of giant cell tumor in other localities. The infrequent occurrence of the tumor at this site, its peculiar pathological structure, and the question of its benign or malignant possibilities prompt this analysis of the recent views in regard to the diagnosis and the accepted form of treatment for this type of lesion.

CASE REPORT

P. S., white, male, thirty-seven years of age, married, pharmacist. He was admitted to the Sinai Hospital at 1 P.M., on October 23, 1932.

Complaint: "Bad" right knee of two and a half years' duration.

Family History: Unimportant.

Past History: The patient had always enjoyed good health.

Present Illness: Two and a half years prior to his admission, the patient struck his right knee. The knee swelled and became red and painful. For a year and a half the knee was recurrently larger and smaller but no medical advice was sought. He again injured the knee, and it became markedly swollen, red, tender and painful and he was unable to walk. A biopsy was done and a diagnosis of giant cell tumor was established. On June 4, 1931, the tumor was incised and curetted and approximately one-half of the patella was removed. After his discharge, he was given deep *x*-ray therapy for approximately six months. A "lump" reappeared at this time which gradually became larger and he again found it impossible to walk.

Physical Examination: On admission, the temperature was 99°F. (R), pulse 90, respirations 20, and blood pressure 130/82. The right knee showed a tumor about the size of a large orange replacing the patella (Fig. 1). The surface was ulcerated, and drained a serosanguinous fluid. The tumor was firm laterally and fluctuated in the center of the prepatellar area. A peculiar crepitus was elicited laterally and the bone felt paper-like. Tenderness, although present, was not pronounced. Motion was restricted in all directions. Aspiration returned bloody. General examination revealed nothing of importance.

Laboratory Findings: Hgb. 86 per cent. W.B.C. 6250, with 64 per cent polymorphonuclear leucocytes. R.B.C. 4,850,000. Roentgenograms of the chest and long bones showed no metastasis. Roentgenogram of the right knee showed a thinned-out patella with complete destruction of the cancellous portion of the bone through which trabeculae can be seen (Fig. 5).

Course: A diagnosis of giant cell tumor of the patella was made and operation was performed on October 28, 1932. The entire patella and the anterior layer of the joint capsule were found to be involved, but the process stopped at this point. There was no extension through the capsule or into the underlying bone structures (Fig. 4). The tumor with the anterior joint capsule and the quadriceps tendon were excised. The defect was closed and muscular function restored by an antogenous graft taken from

* From the Surgical Service, Sinai Hospital.

the fascia lata of the same side. Microscopic examination corroborated the diagnosis of giant cell tumor (Figs. 3 and 4). Complete healing followed and the patient was discharged on December 1, 1932, thirty-nine days after operation. There was no recurrence twenty-three months later. (Figs. 6 and 7.)

frank giant cell tumor may become malignant, while Stone and Ewing maintain that rarely, if ever, does a true giant cell tumor metastasize. No case of giant cell tumor of the patella has shown a malignant or metastatic behaviorism. (Table 1.)

Table 1

Author	*Year*	*Age*	*Sex*	*Side*	*Post-op. Diag.*	*Method of Diag.*	*Met.*	*Etiology*	*Operation*	*Recur.*
Abadie, J.	1928	45	F	Rt.	G. C. tumor	Clin. mic.	Neg.	No mention	Excision	None
Abadie, J.	1928	31	F	Lt.	G. C. tumor	Mic.	Neg.	Trauma	Curette excision plastic	None
Baldwin*	1925	19	M	?	G. C. tumor	*X*-ray clin. mic.	Neg.	Trauma	Excision	None
Cole, W. H.	1925	32	F	Lt.	G. C. tumor	Mic.	Neg.	Trauma	Curette phenol	None†
Faltin, R.‡	1925	27	F	Rt.	G. C. tumor	Mic.	Neg.	None	Curette	None
Giordano, G.	1928	20	F	Rt.	G. C. tumor	Clin. *x*-ray mic.	Neg.	Trauma	Excision plastic	None
Inclan, A.	1930	35	F	Lt.	G. C. tumor	Clin. *x*-ray mic.	Neg.	Trauma	Excision plastic	None
Jones, R.	1895	20	F	Rt.	G. C. tumor	Mic.	Neg.	Trauma	Amp.	None
King, M. J. Towne, G. S.	1929	19	M	Lt.	G. C. tumor	Clin. *x*-ray mic.	Neg.	Trauma	Excision curette	Pos.§
Kraft, E.¶	1931	32	F	Rt.	G. C. tumor	*X*-ray mic.	Neg.	?	Curette	None
Kudek, F.	1907	25	M	Rt.	G. C. tumor	Mic.	Neg.	Trauma	Excision	None
Linde, S. A.	1932	37	M	Rt.	G. C. tumor	Clin. *x*-ray mic.	Neg.	Trauma	Excision plastic	None
Moravek, A.	1907	30	M	Rt.	G. C. tumor	Mic.	Neg.	Trauma	Excision plastic	None
Wanach, R.	1910	37	F	Lt.	G. C. tumor	Mic.	Neg.	Trauma	Excision plastic	None

* This case is included in the reported manuscript of W. H. Cole (see References).
† No recurrence after second operation.
‡ No recurrence five years after operation. Patella regenerated.
§ Small recurrence two years after curettage. No recurrence after second operation.
¶ #1162—Registry of Bone Sarcoma of the American College of Surgeons.

HISTORICAL

Lebert in 1845 was the first to differentiate sarcoma from carcinoma of the bone microscopically. He was followed in 1853 by Paget who recognized a variety of bone tumors containing large giant cells. This work was further extended by Nelaton in 1860. In 1879 Gross emphasized the benign character of giant cell tumors of bone, but admitted the possibility of malignant changes. Although these tumors are today considered benign, the question of possible malignant changes is still a moot one, although considered remote. Coley reports 9 cases of metastasis in a series of 50 and concludes that a

ETIOLOGY (Table 1)

Giant cell tumor occurs usually in the second and third decades of life. Females, in this series, predominated over males in the proportion of 9:5. The primal and accepted factor in the causation of this tumor is trauma. In one case, no mention of trauma was made, in another, it was questionable, but in only one instance was it denied. The mechanism of the formation of the tumor is unique and is thus described by Geschickter and Copeland: "Following injury, there is a disruption of the cortical blood supply producing an inbalance between osteoclastic proliferation in the medulla and the reactive compact bone in the cortex."

PATHOLOGY

Grossly, the tumor is hemorrhagic, appearing not unlike granulation tissue. It is friable and bleeds easily. Usually red, it occasionally assumes a gray putty color. Fibrous areas can be palpated, extending inward from the periphery. These are trabeculae which show on the roentgen film. Microscopically they are seen to be fibrous septa. The entire mass is encapsulated by a bony shell, more or less thinned, which may present perforations depending upon the age of the growth, the resistance of the cortical bone and the defensive connective tissue reaction of the host, which makes an attempt to stem the invasion.

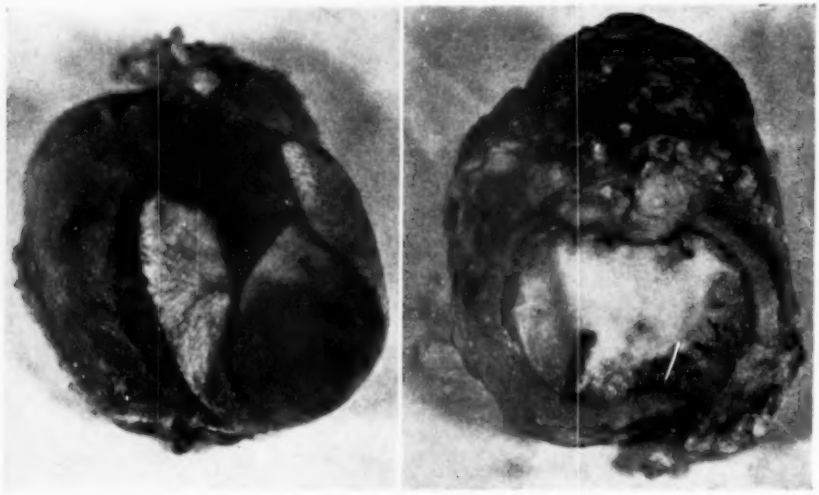

Fig. 1. Fig. 2.

Fig. 1. Anterior view, showing patella replaced by tumor. Skin surface is ulcerated and hemorrhagic.
Fig. 2. Posterior view, showing complete involvement of soft structures up to but not including posterior surface of synovial membrane.

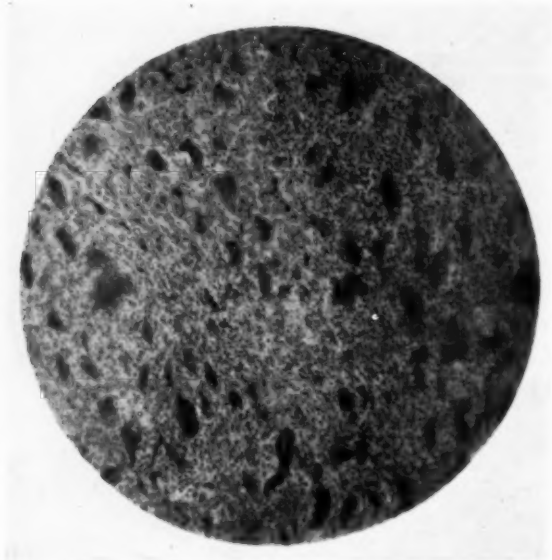

Fig. 3. Low power, showing large number of giant cells, cellular stroma and connective tissue trabeculae.

The microscopic section consists chiefly of large multinucleated giant cells embedded in a mass of small round cells and spindle cells. The nuclei of the giant cells are large and more or less centrally located. Red blood cells both free and enclosed by endothelial walls, infiltrate the tumor to a large degree, rendering the tumor vascular and at the same time hemorrhagic. In the usual type of giant cell tumor, the round cells greatly outnumber the spindle cells. It is interesting to note that a predominance of spindle cells, with its coincident diminution in the number of giant cells, indicates a healing process and is aptly named a spindle cell variant of giant cell tumor. It is so classed by Geschickter and Copeland.

ROENTGENOLOGIC FINDINGS

The roentgenograms emphasize the destructive nature of the tumor. In the patella, all that remains of the bony

structure is a thinned and expanded bony shell with destruction of the cancellous portion, through which striations or trabeculae can be seen, as is beautifully shown in Figure 5. There is no extension into the neighboring bone or soft structures, although this may occur if the tumor be permitted to grow unheeded and rupture its retaining wall. The extension usually involves the soft tissues surrounding the patella rather than the neighboring bone.

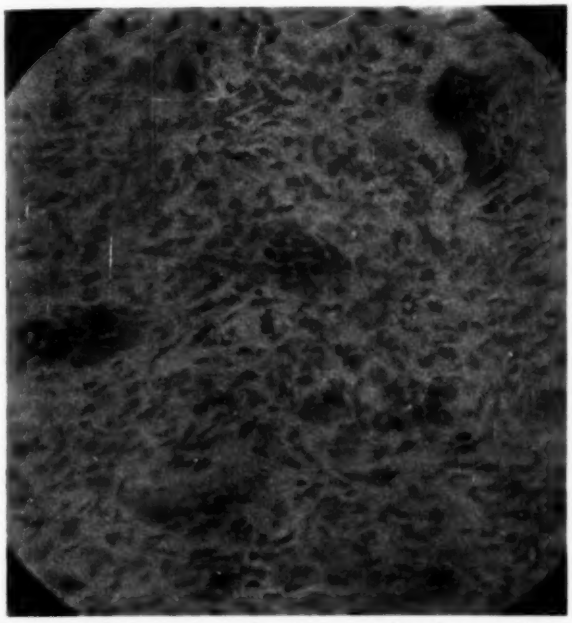

Fig. 4. High power, showing multinucleated giant cells and stroma composed of small round cells and spindle cells.

SYMPTOMS

The usual sequence of symptoms is: (1) history of trauma; (2) pain; (3) tumefaction; (4) difficulty in locomotion. Not infrequently, the skin over the patella becomes ulcerated and exudes a serosanguinous material. Aspiration is bloody. There is no temperature reaction and no alteration in the blood cellular elements.

GROWTH TENDENCIES (Table 1)

The question of the benign or malignant qualities of this tumor is a moot one. Most schools lean toward the former belief although admitting the possibility of malignant tendencies. The cases on record, involving the patella, present a picture of benign temper, no case resulting in malignancy. Two cases showed small recurrences, but in both, the operation was by curette, a method open to the greatest percentage of error. Subsequent curettage was followed by healing in both cases with no recurrence up to this time. Dean Lewis has further emphasized the benign character of giant cell tumor in his report of 17 cases involving the vertebrae, in none of which did the patient die of tumor, and the majority of which healed after curettage without difficulty.

Fig. 5. Destruction of cancellous portion of patella. Note striations in patella, and normal neighboring bone.

RECURRENCE

The tumor, although it does not metastasize, will recur if not completely removed and it is this recurrence which has led many of us to suspect malignant tendencies. Geschickter, Copeland and

Bloodgood have aptly summarized the question of recurrence as the result of one of three fallacies: (1) incomplete

Fig. 6. Four months after operation. Healed scar of right knee in standing posture. Note atrophy which has since improved.

removal of the tumor due to either operative difficulty or inexperience; (2) failure to use chemical or thermal cauterization after curettage; (3) Attempting curettage when the bone shell is perforated or too much destroyed.

Careful consideration should be given to the degree of patellar destruction, and the best operative procedure instituted. With these factors in mind, a careful and complete enucleation of the tumor will result in complete cure.

PROGNOSIS

From all indications, giant cell tumors of the patella are benign. There have been no reported cases of metastasis in the literature from the tumor at this site, and no case has resulted in a fatality (Table 1).

TREATMENT

The treatment depends upon the degree of patellar destruction. Incision, curettage and the application of phenol or the actual cautery is sufficient to eradicate the smaller tumors. In the more involved cases the employment of curettage is frequently followed by recurrence, and excision would have been the operation of choice. Conse-

Fig. 7. Four months after operation. Normal right angle flexion of right knee.

quently if the tumor has completely destroyed the patella, as it did in the author's case, then complete excision should be done, followed by some accepted variety of plastic restoration. A pedicle flap taken from the fascia of the quadriceps muscle or an isolated autogenous graft using the fascia lata has been found very useful and most satisfactory. In the author's case, which entailed removal of the anterior face of the joint, including the capsule and the quadriceps tendon, the latter type of restoration was used with excellent results.

SUMMARY AND CONCLUSIONS

1. A case of primary giant cell tumor of the patella is reported. There has been no recurrence twenty-three months after operation.

2. Trauma plays a most important part in the causation of giant cell tumor of the patella.

3. Giant cell tumor of the patella is essentially confined to young adults in the second and third decades of life.

4. Females are subject to invasion by giant cell tumor in the proportion of 9:5.

5. Giant cell tumors of the patella are essentially benign.

6. The predominance of spindle cells in the microscopic section indicates a healing process.

7. The early diagnosis and prompt institution of operative therapy lessens the necessity for radical operation.

8. The value of deep *x*-ray therapy and radium emanation is questionable.

9. The choice of therapy is that which completely removes the growth.

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FORENSIC MEDICINE

EDITOR: HARRISON S. MARTLAND, M.D.

PLASTIC SURGERY AND CRIMINALS: THE SURGEON'S RESPONSIBILITY

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THE increasing use of surgery by criminals in an effort to conceal identity undoubtedly has placed added responsibilities upon the practitioner. Inquiries made by the Federal Bureau of Investigation of the United States Department of Justice have disclosed several instances in which irresponsible physicians have attempted to alter the facial appearance and the finger patterns of known criminals. Certainly, there exists no necessity here for an explicit condemnation of such activities. The criminal implications of such conduct on the part of persons with medical experience are understood at once by members of the profession. No doubt exists as to what is and what will be the attitude of the Department of Justice toward such interference with the processes of justice.

Apart from obviously criminal activities, a situation exists which perhaps requires some discussion as to the responsibility of the ethical practitioner. It would appear that in the conduct of ordinary practice the surgeon would be alert to avoid rendering unintended assistance to the changing of the appearance of patients who wish to conceal identity. Further, a distinct responsibility rests on the surgeon in cases of doubt to inform the authorities of such attempts. It is hardly necessary to say that where operations are performed under such circumstances that the fugitive character of the patient is apparent, the attitude of the Department of Justice will be to consider the physician or surgeon as conspiring to harbor, or harboring, the fugitive.

A study of the possibilities of altering fingerprints by surgical methods and skin grafting has led to the conclusion that such operations could be performed only by skilled surgeons and that ethical practitioners would not so act, since the reasons for the operation would be obvious. Certainly, the most skilled physicians would not handle such cases.

Opinions differ as to the degree of the scars left following such operations, but it is generally admitted that definite delineations would be apparent in all cases. Further, tissue taken from another part of the body and grafted to the finger tips would not bear the same ridge formations as appear on the bulbs of the fingers. The attention of peace officers taking impressions subsequently would be drawn at once to the fact that an operation had been performed, and the subject would certainly be held for identification. It would appear, therefore, that the interference with natural finger ridge formations would serve only to obstruct and not to defeat identification.

An outstanding example of the failure of such enterprises is that involving the attempt of John Dillinger to lose his identity by alteration of his fingers. The

[Concluded on p. 159.]

THE NARCOTIC PROBLEM

IN ITS RELATION TO PHYSICIANS AND SURGEONS

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WITH respect to a comfortable majority of the members of the medical profession in the United States, it can be said that the Federal narcotic law enforcement problem is merely a matter of supervising Harrison narcotic law registration and the issue of official order forms, with occasional advice as to procedure under the law and regulations in a particular case or cases. These duties are so far routine as to make it unfair to the law-abiding majority to speak of a "problem" with respect to their purchasing, prescribing or dispensing of narcotics under the law.

There are in the medical profession, however, just as in other professions, practitioners who fail to give even colorable adherence to the code of ethics and still others who hover on the borderline. These unworthy members and their activities with respect to the use of narcotics represent the very important part of the narcotic problem that I wish to discuss.

The practicing physician knows, of course, that the legal limitation upon the dispensing or prescribing of narcotic drugs and preparations by him is that it shall be "in the course of professional practice only"; this is the test of proper dispensing or prescribing provided by the Harrison Narcotic Law, as amended. Equally well-known, perhaps, is the interpretation of the United States Supreme Court that an order purporting to be a prescription issued to an addict or habitual user of narcotics, not in the course of professional treatment but for the purpose of providing the user with narcotics sufficient to keep him comfortable by maintaining his customary use, is not a prescription within the meaning and intent of the (Harrison) act; and the person filling and receiving drugs under such an order, as well as the person issuing it, may be regarded as guilty of violation of the law. This is the fundamental principle which guides the Federal enforcement officer in determining whether the physician under investigation shall be reported for a violation of the Federal law, and it should likewise guide the practitioner in his dispensing and prescribing of narcotics.

With this in mind, let us consider the case of Doctor X, a physician in a western state. Three years ago, the doctor was investigated and was found to have purchased over a period of about five months more than 18,000 one-half grain tablets of morphine. He gave the officers a list of what purported to be the names and addresses of the patients to whom he was dispensing morphine daily in his office. None of the patients could be located at the addresses given, and when asked for an explanation, the doctor stated he had given false addresses to prevent the agents from interviewing the patients. Finally, the officers were permitted to interview two of the patients, both of whom were receiving the drug merely to gratify addiction, one of them being a known drug peddler.

The investigation proceeded, slowly and carefully, with every effort being made to determine the nature and extent of the physician's activities with respect to narcotics. A check disclosed that from late in

June, 1932 to the latter part of January, 1934, he had purchased and disposed of 54,900 one-half grain tablets of morphine, and when called upon refused to disclose the identity of his patients or discuss their physical condition. At this time, one of his alleged patients was located and submitted an affidavit that she had paid the physician $900 for morphine between September, 1933 and January, 1934. It was learned that the physician had at some time previously been dropped from the rolls of the county medical society, and a copy was obtained of a handbill which he had caused to be distributed publishing a scale of prices for various medical treatments, such as "Confinement cases $50," "Treatment for skin infection, $1.00," and others, with the slogan "Pay for what you get, get what you pay for."

In the spring of 1934, additional evidence was obtained of the constant administration of morphine by the physician to an addict who was known to have no medical need for the drug. An indictment was returned and the doctor was prosecuted, and the court, according to report, pointed out in his instructions to the jury that the law gives to physicians wide discretion in the personal administration of narcotics to patients. These instructions were somewhat different from those given juries in similar cases in other districts, and the jury returned a verdict of acquittal.

The particular case against this physician is therefore closed, but the result of the case cannot be accepted as a vindication of his activities with respect to narcotics, not even, I believe, by the sincere ethical practitioners in his own community and elsewhere. The verdict of the jury, who were presumably laymen with no previous special knowledge of the use of narcotics, was at best only the gift to the doctor of the benefit of the doubt. To a jury of reputable physicians, I venture the opinion that there could have been no doubt in the case from which the doctor on trial could have benefited. As there was much newspaper publicity given to the case, the inquiry arises as to whether the local medical society could not make its own independent investigation and if the facts justified the step—and surely they must—to cause the license of this physician to be revoked. As long as the physician is duly qualified under the state law to practice, he will be entitled to registration under the Harrison Narcotic law, and to revoke his license for cause would eliminate him as a narcotic problem much more effectively than the longer and more expensive method of investigation under the Harrison law, terminating in a prosecution which may, on occasion, be unsuccessful as we have seen.

Fortunately, the disappointing result of the case described represents the exception and not the rule, as the Bureau seeks to prosecute only those practitioners who seem wilfully and knowingly to have violated the law, and in this policy it usually has the approval if not the active support of the reputable local practitioners who have no sympathy with the member who has clearly abused his professional privilege. The wilful violator, generally speaking, receives sooner or later his penalty under the law. From time to time, however, there is reported another class of practitioners, also relatively few in number, who become the subjects of the so-called "borderline" cases. This type of physician has dispensed to or prescribed for one or several addicts under circumstances that give rise to doubt as to whether he actually intended to violate the law. There may be no evidence of commercialism, or the physician may have been mistaken as to the addict's medical need for the drug. The facts tend to show a violation or violations of the law, but arising through a degree of carelessness rather than wilful disregard of its provisions. In these cases, the law permits a compromise upon payment of a suitable sum of money to the United States by the subject in lieu of prosecution. Still another class of practitioners may be guilty of what may be termed irregularities of a minor nature, amounting to violations of regulations concerning the proper preparation of prescriptions, for instance, and such cases are closed with an admonition against repeat-

ing the offense.

A special problem arises in connection with those members of the medical profession who have themselves succumbed to narcotic enslavement, and are addicted to the abusive use of narcotic drugs. These doctor-addicts present a perplexing problem indeed. If they dispense narcotics only to themselves, not having a bona fide medical need therefor, the policy is to urge them to take scientific treatment for the drug addiction, and to refrain from handling narcotics for a period thereafter in the hope of avoiding temptation until completely rehabilitated. Unfortunately, there is of course, a strong tendency to relapse into the use of the drug, particularly when it is so readily obtainable under a professional registration. To offset this, it is urged that the several state boards to whom these doctors are reported arrange to suspend their licenses for a sufficient period to enable them to become rehabilitated, with the warning that a relapse will mean final revocation of the license. The probability of revocation of his license to practice should be a strong deterrent against recidivism.

There are certain aspects of narcotic drug traffic control that cannot readily be covered by the present Federal law. Thus, the prevention and punishment of the forging or false execution of narcotic prescriptions is a duty that should be assumed by the State rather than the Federal government. The revocation of a practitioner's license as a result of conviction of violations of narcotic laws should clearly constitute a State rather than a Federal function. Such matters as these are covered in the Uniform State narcotic law, adopted by the Conference of Commissioners on Uniform State Laws, and approved by the American Bar Association and the American Medical Association. This law has at present been adopted as legislation by nine states, but it should be more generally enacted, and it is hoped that State medical associations will give it their active support when it shall be considered by the legislatures of such of the forty states as shall have sessions during this year which have not yet enacted the measure into law.

The interests of the medical profession and of the Bureau of narcotics with respect to the control of the narcotic drug traffic are not, in my opinion, conflicting; I apprehend that the common purpose is to limit the sale, distribution and use of narcotic drugs and preparations to that required for bona fide medical and scientific purposes only. I venture to hope that the Bureau enjoys and will continue to enjoy the friendly cooperation of the medical profession as a whole in accomplishing this purpose through its administration of the Federal Narcotic laws. Without such friendly cooperation on the part of the medical profession, it is difficult to imagine how continued progress towards the common end could be made.

CONCLUSION OF MR. HOOVER'S ARTICLE*

mutilation was performed by a physician engaged by Dillinger for this purpose. How signally the attempt failed was demonstrated when following the death of the fugitive his finger impressions were taken and found to show more than three hundred points or characteristics. The surgeon who performed the operation is now serving a sentence in a federal penitentiary for his part in the attempt to obstruct justice.

More effective than the force of penal legislation prohibiting the concealment of fugitives are the moral standards enforced by the profession itself. Upon these standards, the welfare of the profession as well as that of the general public will depend. The utmost efforts will be exerted by the Department of Justice in rendering such assistance in the maintenance of ethical standards as may be afforded by vigorous investigation and prosecution of offenders.

*Continued from p. 156.

THE PRESENT STATUS OF

THE PROBLEM OF TRAUMATIC SHOCK

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PROBABLY the main reason why an article on traumatic shock should be considered appropriate for a section on forensic medicine is because the condition of shock so frequently follows accidental injury. While numerous protective appliances have been devised and adopted by industry, thereby diminishing the hazards of the factory as regards injury, one kind of accident, that dependent on the use of the automobile, is ever increasing. At present the automobile kills and maims each year as many persons as would be injured in a war of considerable dimensions. The automobile has given rise to new problems for the hospital and the doctor, from both the legal and medical standpoints, and has emphasized old problems one of which is traumatic shock.

The many papers dealing with the subject of shock which have appeared in recent medical and scientific journals indicate the perennial nature of the problem. New interest in shock has been aroused by the researches of a number of investigators whose findings have called into question certain conclusions that had previously appeared to be well established. It is not our intention in this paper to review the extensive literature that has accumulated on the phenomenon known as shock, as this task has been ably performed by Cannon (1923) in his monograph on truamatic shock, and the more recent literature on the subject has been reviewed by Blalock (1934) and by Rukstinat (1932). Our purpose is rather to outline briefly the researches that have given rise to current concepts of the cause of shock, and to indicate what appears to be the present status of the problem.

The word "shock" was first applied to the sudden collapse that frequently results from severe injury. As time passed the word came to be employed in describing a multitude of conditions which were due to a wide variety of causes. The word was used so loosely that it became the designation for any state of circulatory collapse the nature of which was obscure. Consequently, "shock" ceased to have value as a significant term. Workers who were attempting to clarify the problem of shock have repeatedly advocated discontinuing the use of the word altogether, and have proposed names more descriptive of the condition to which the term was originally applied; their suggestions, however, have not been adopted. The word, shock, still persists, but it is now usually combined with qualifying words or phrases which indicate the precursor of the condition, as, for example, traumatic shock, postoperative shock, anaphylactic shock, histamine shock, shock due to hemorrhage, and so forth. Such a combination of terms indicates through what agency the characteristic condition was brought about but it obviously does not explain the physiologic mechanism involved in producing it. When the proper qualifying words are employed, there is less objection to the use of the term, shock.

The syndrome that has come to be known as traumatic shock has confronted the medical profession since earliest time, but substantial progress in the elucidation of its underlying causes has been made principally in the present century. In an attempt to account for the cause of trau-

matic shock, theory after theory has been advanced. Thus we have had (1) the theory of inhibition, (2) the theory of fat embolism, (3) the theory of vasomotor paralysis, (4) the theory of exhaustion, (5) the theory of hypo-activity and hyperactivity of the suprarenal glands, (6) the theory of acidosis, (7) the theory of acapnia, (8) the theory of capillary congestion, and finally, (9) the theory of toxemia. The foregoing list, which is not complete, indicates the involved nature of the problem. Each theory in turn has served to focus attention on certain aspects of the problem, and has proved of value as a stimulus to further research, which is the chief purpose of any theory. It is not surprising that all the theories proposed thus far have been found inadequate when tested by more complete information derived from clinical observations and experiments on animals. Through the efforts of many investigators the mystery that shrouded the subject of traumatic shock at the beginning of the present century has been replaced by more definite facts in regard to the causes of the syndrome and its treatment, although knowledge concerning the condition is far from complete.

As a result of experiences in the World War and experimentation on animals, traumatic shock was classified into two types, primary and secondary. Primary shock was defined as sudden collapse occurring immediately after severe injury. This type of shock was considered as indistinguishable from syncope and collapse. Secondary shock was defined as the collapse that occurs after a variable period of time has elapsed following severe injury. In a recent article Cannon remarked that the phenomenon of shock may be separated into primary and secondary conditions, and that if the primary condition is present it explains the secondary condition because this latter is the natural result of the former. A discussion of the primary condition and the secondary condition of shock causes a certain degree of confusion if the type of shock is not indicated. It would make for clarity if the two types of shock could be classified as immediate, and delayed, traumatic shock. Immediate traumatic shock would include all cases in which the symptoms appear soon after injury, and delayed traumatic shock would refer to those cases in which the onset of symptoms requires considerable time. At any event, as Cannon has pointed out, the central problem in traumatic shock is to define the primary feature and to explain it. There seems to be complete agreement that the primary feature, whether the shock is immediate or delayed, is low arterial blood pressure. In either type of shock, if a low blood pressure persists for an hour or more, the secondary condition appears and is attended by the phenomena associated with oxygen lack, such as decreased metabolic rate and decreased alkaline reserve.

Immediate shock following severe injury, such as may be encountered on the battlefield or which may result from accidents, has been considered in the absence of severe hemorrhage to be due to some derangement of the nervous system. The lack of more specific information as to the causes of this condition is due in no small measure to the difficulty of reproducing the condition in the laboratory. For humane reasons the conceptions regarding the cause of this phenomenon cannot adequately be investigated experimentally. Little advancement has been made in accounting for this type of shock since the early work of Goltz, who demonstrated that reflex cardiac and vasomotor paralysis or inhibition resulted from striking a frog repeatedly on the abdomen.

Delayed or so-called secondary shock, however, admits of experimental approach, and sufficient data have been amassed to indicate more clearly the factors involved in producing this condition. In brief, the symptoms characteristic of delayed shock have been repeatedly reproduced in animals by any one of the following methods: (1) by repeated bleedings from an artery

or vein, (2) by traumatizing the intestines, (3) by traumatizing large masses of skeletal muscle, or (4) by superficial burns.

Many investigators have shown that the vascular system of an animal is able to compensate for the repeated withdrawal of small amounts of blood. The degree of compensation varies with the individual animal. Some animals may show only slight depression of the blood pressure until nearly half of the estimated volume of blood has been removed. Others may show a definite depression of arterial blood pressure after removal of only 10 to 15 per cent, but in every instance there appears to be a point beyond which the withdrawal of additional blood will produce a permanent decrease in blood pressure. The maintenance of the blood pressure under such conditions is known to be due to vasoconstriction, but it is evident that the latter cannot continue to operate indefinitely in the face of a decreasing volume of blood. A point must necessarily be reached when the blood supply to the tissues becomes inadequate and the mechanism fails due probably to the resulting decreased flow of blood and anoxemia. At this point the symptoms characteristic of delayed shock appear and death follows more or less rapidly. The end results of a blood pressure maintained at or below 70 mm. of mercury are practically identical with what occurs in delayed shock as far as the effect on the capillaries and other tissues is concerned. (Cannon, 1923, Blalock, 1934, Mann, 1915.)

Traumatism of the intestines was the method usually used by early workers to induce experimental shock. In the early work of one of us (Mann, 1914) it was shown that shock produced by this means was not due to paralysis of the vasomotor mechanism of the splanchnic area, since the peripheral untraumatized visceral arteries are constricted in delayed shock. It was also demonstrated that such shock was not due to the various other causes which had been suggested by previous workers, but that it was due to a decreased volume of circulating medium. It was pointed out that the amount of circulating fluid was further diminished by the stagnation of the blood in the smaller veins and capillaries in the traumatized region. When the circulating volume of blood has been sufficiently reduced, the blood pressure declines and all the symptoms of shock appear. It was further demonstrated (Mann, 1914, 1915) that whereas 76 per cent of the estimated volume of blood of control dogs could be recovered from the femoral artery and heart, only 39 per cent could be recovered from the femoral artery and heart of dogs whose blood pressure had been markedly reduced by traumatizing the viscera. This work has been amply confirmed by the more recent work of Beard and Blalock (1932), who determined the amount of fluid lost from the circulating blood due to traumatization of the intestines and found that shock thus produced could be accounted for wholly on the basis of a decreased volume of blood resulting from the exudation of plasma into and from the visceral tissues. There can be little doubt that this is the true explanation, since the amount of fluid lost was measured and found to be equal to as much as 4 per cent of the body weight.

The low blood pressure resulting from trauma to the limbs of animals has been studied by several competent observers, but the conclusions drawn from similar experiments are not in agreement. Cannon and Bayliss (1919), and later Cannon (1923), produced shock by trauma to the hind limbs of cats. After a low blood pressure had been established for a sufficient time for secondary shock to be evident, the two hind limbs, one traumatized and the other untraumatized, were removed by symmetrical cuts and weighted. By this method a sufficient difference in weight was not obtained to account for the fall in blood pressure on the basis of a decreased volume of blood due to loss of blood into the traumatized tissues. In view of the fact that a number of observers had previously suggested that traumatic shock

was due to the absorption of toxic substances from traumatized tissues, and in view of the fact that histamine or histamine-like substances had been demonstrated in animal tissues, it was a logical step to attribute the lowered blood pressure following trauma to the absorption of toxic substances from the traumatized tissues which exerted on the peripheral vessels a histamine-like effect with a consequent lowering of the blood pressure. The toxemia theory of traumatic shock thus took its place and was generally accepted as the best explanation of delayed traumatic shock. The problem was considered settled until the whole question was reopened by Parsons and Phemister (1930), who altered the technic of removing the posterior half of the body and comparing the weights of the two quarters. Owing to this change in method, these workers found that traumatism of a limb of a dog which produces a marked fall in blood pressure is accompanied by a corresponding increase in limb volume and loss of blood, both of which were due very largely to hemorrhage into injured tissues which they concluded was of sufficient magnitude to be the preponderant factor in the production of circulatory failure. They did not obtain evidence from their experiments of the absorption of a toxic substance from the traumatized tissues.

Blalock (1930) made a most intensive study of the cause of low blood pressure following injury to the muscles of dogs. The method of Parsons and Phemister was used in determining the difference in the weight of the traumatized and control limbs. His results are in agreement with those of Parsons and Phemister. Blalock found a difference in the weights of the two extremities amounting to more than 4 per cent of the body weight. There appears to be little doubt that sectioning limbs after the manner of Cannon and Bayliss does not include all the region containing extravasated blood resulting from the trauma. Although Blalock in all his experiments found a sufficient loss of blood into the traumatized area to account for the reduction in blood pressure, he tested the toxemia theory of traumatic shock in a more thorough fashion. Preventing the return of blood from the traumatized limb by appropriate tourniquets gave results comparable to those obtained when free circulation was permitted. In such experiments the low blood pressure could not be due to the effect of a toxic substance entering the general circulation, but was due to the loss of fluid into the traumatized region. Furthermore, blood removed from dogs with low blood pressure resulting from traumatism of the muscles of the limb, when injected intravenously into intact dogs, failed to produce a fall in the blood pressure of the recipient. If a toxic substance had been present, a fall in blood pressure should have occurred, since large amounts of blood were used. Blalock concluded that his findings offered no evidence that trauma to an extremity produces a toxin which causes general dilatation of capillaries with an increase in capillary permeability and a general loss of fluid from the blood stream.

Freedlander and Lenhart (1932), by standardized trauma to the limbs of cats, repeated the experiments of Cannon and of Blalock, but in addition they completely excluded the influence of the nervous system. They also studied the effect on the blood pressure of rapidly bleeding control cats of amounts of blood equal to that extravasated into the traumatized limb. Their results were in agreement with those of Blalock, and they concluded that shock following trauma can be explained on the basis of hemorrhage and loss of fluid into the traumatized region. The recent work of Herbst (1933) on rabbits is in agreement with the findings of Blalock.

Roome and Wilson (1934) studied the effect on the blood pressure of extracts from traumatized tissues prepared from the limbs of dogs. They found that centrifuged extracts of traumatized limbs caused no depression in blood pressure when perfused as a whole in a second animal, but

that such extracts caused a rise in blood pressure. Extracts of traumatized muscle alone were slightly toxic but did not cause a sustained fall in blood pressure or death.

Evidence in favor of the toxemia theory of shock was obtained by Moon and Kennedy. The major purpose of their investigation was to make a comparison of the histologic changes that occurred in the tissues of the shocked animal with those found in the tissues of an animal from which large amounts of blood had been withdrawn. They found that the syndrome of shock was accompanied by gross and microscopic changes which were opposite in character to those produced by hemorrhage. The changes included dilatation and engorgement of capillaries and venules, permeability of capillary walls, as indicated by petechial hemorrhages and edema, and frequently, effusion into serous cavities. They concluded that increased concentration of the blood is a characteristic phenomenon of shock. These circulatory effects were produced by trauma, by intravenous or intraperitoneal injections of extract of normal muscle, or by implanting muscle substance into the peritoneal cavity.

In a recent paper, Cannon (1934) warned against dropping the toxemia theory of traumatic shock unreservedly, as he was of the opinion that toxic products might be involved to some extent in producing the condition. In view of the support that the work of Moon and Kennedy (1932) lends to the toxemia theory, it may be advisable at present to withhold final judgment on the matter. There is, however, a much greater array of evidence against than in support of the toxemia theory of traumatic shock.

Delayed shock resulting from severe superficial burns has been thought to be due to the absorption of toxic products from the injured regions. The work of Blalock (1931) and of Johnson and Blalock (1931) leads to the conclusion that the low blood pressure following burns can be explained on the basis of a decreased volume of blood resulting from the loss of fluids into and through the burned areas.

At present, none of the theories of shock has been proved; not one of the mechanisms so far ascribed as causing the condition is universally accepted. There appears to be a general agreement in only one regard, namely, that traumatic shock is associated with a decreased volume of circulating blood. It seems clear that any injury that results in a decrease in the amount of circulating blood predisposes to shock, and that the syndrome of shock is principally the result of deficiency of a circulating medium.

The present status of the problem of shock can probably be summarized best by a description of the mechanism producing the syndrome of shock as based on the data we have reviewed and the results of our own investigations. Certain types of injury cause a decrease in the volume of circulating fluid. The mechanism causing this loss of fluid, and where the fluid goes, is, for the most part, not known. In all probability there are many factors involved, and the mechanism may conceivably be different in the various types of injury. After some injuries whole blood is probably lost either as gross extravasation into the traumatized tissues or as capillary stagnation in certain vascular areas. In other types of injury the fluid of the blood may be lost, thus producing a concentration of the circulating medium. Shock and hemorrhage are identical in one respect, namely, that there is a decrease in the amount of circulating blood in both conditions. Thus there is a similarity in the physiologic aspects of the two conditions, although the pathologic findings may be quite different. This conception of the relationship between shock and hemorrhage explains the fact, which has been demonstrated so frequently both clinically and experimentally, that a hemorrhage which would be insignificant in the normal state will aggravate or prove fatal in the condition of shock. As the fluid volume of the blood decreases, the vasomotor mech-

anism attempts to compensate for this loss and maintain an effective blood pressure. Thus there is an increased vasomotor constriction in most of the vascular areas of the body during the development of the condition of shock. In view of the fact that so much attention is directed to the blood pressure in shock, it should be recalled that the purpose of maintaining an effective blood pressure is to supply an adequate flow of blood. If the flow of blood, particularly to the head, could be measured in the shocked patient, it would probably be a more reliable criterion of the condition than the blood pressure. When the loss of circulating fluid reaches the point where the compensatory mechanism no longer can maintain an effective flow of blood, an irreversible mechanism occurs which leads to death.

While our review has indicated that the initial factors producing shock are not fully understood, it must not be supposed that the large number of experimental investigations and clinical observations have not been of value in clarifying conceptions of the nature of shock, and particularly in concentrating the methods of treatment in a few relatively simple procedures. Since the fundamental factor producing the syndrome of shock is a decreased volume of circulating blood, the best treatment of the condition is the transfusion of blood, or, if blood is not available, the injection of an adequate artificial medium such as acacia. It is also obvious that transfusion should be accompanied by those supporting measures that artificially take the place of the functions of the blood, which have decreased with the decreased blood flow, such as the application of heat to supply the loss of this form of energy due to a decreasing metabolic rate. These methods of treatment, when instituted early in the development of the condition, produce better results than other methods because they are directed toward relieving the principal deficiency in shock, a decreased volume of blood. When the tissues of the body have been subjected to an inadequate flow of blood for too long a period of time, no treatment yet devised will save life.

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AN UNUSUAL CASE OF SUICIDE

THREE THROUGH-AND-THROUGH BULLET WOUNDS OF THE HEART*

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ONE is sometimes confronted with the problem whether, in a given case, death has resulted from suicide or homicide. This problem becomes particularly difficult in cases which present multiple lacerations or puncture wounds of the body. Among the sources of information which are of particular value the postmortem examination is, perhaps, the most important one. This is well illustrated by a case which has recently come under my observation.

REPORT OF CASE

History: An adult male was found shot to death in a furnished apartment in which he lived alone. The apartment consisted of a room eight by five feet, which contained a single sized bed, a dresser with mirror, and a chair; also, a small narrow clothes closet, without a door, and a washroom. The apartment was on the second floor of a four story building and was elevated 15 feet from the sidewalk. There was one door, without transom, and one window in the apartment. The window was locked in the usual manner, and the door was securely bolted shut on the inside. The deceased was found dressed and seated in a chair in the closet, a 25 calibre automatic pistol on the floor near his outstretched right hand. The shells of the discharged cartridges were found in positions which were ascribed to the proximity of the walls in the closet. There was no evidence of disorder in the apartment, and no one was found who had heard the shooting. The deceased's identity was not established; there was no correspondence, clothes marks, or record of his finger prints. The body was buried by the County because he was destitute.

The postmortem examination revealed an adult cachectic white male, about forty-five years of age, 5 feet 9 inches long, weighing 130 pounds. The pupils were dilated, the eyes were sunken and softened, the cornea was hazy, and the body heat was absent. Rigor mortis was slightly present in the jaws and neck, diminished to absent in the extremities. Death had occurred between twenty-four and thirty hours before the postmortem examination. There were three bullet wounds of entrance in the anterior chest wall on the left side (see Fig. 1) and one bullet wound of exit in the back in the tenth intercostal space 3 cm. to the right of the midline. The bullet wounds are numbered in the order in which, we presume, they were sustained. We assume that the largest wound of entrance occurred at the time the ventricles were intact. We know that the size of perforations occurring in hollow viscera are related to the amount of distention of the hollow viscera at the time the perforations are sustained. Number 1 bullet wound of entrance was in the fifth intercostal space 1.5 cm. medial to the mammary gland. This wound measured 5 by 5 mm. and was surrounded by an area of burnishing of the skin which ranged in size from 7 mm. in the inferior aspect to 10 mm. in the superior aspect. Number 2 bullet wound of entrance was in the fourth intercostal space 5 mm. medial to the mammary gland. This wound measured 8 by 11 mm. and was surrounded by an area of burnishing of the skin 5 mm. in diameter. Number three bullet wound of entrance was over the fifth costal cartilage 3 cm. medial to the nipple. This wound measured 5 by 5 mm. and was surrounded by an area of burnishing of the skin which ranged in size from 5 mm. in diameter in the inferior aspect to 1 cm. in the superior aspect. There was singeing of the hair of the chest adjacent to the wounds. There was a bullet wound of exit in the skin of the back in the tenth inter-

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costal space 3 cm. to the right of the midline which correspond to number 2 bullet wound of entrance. Number 3 bullet (25 calibre auto-

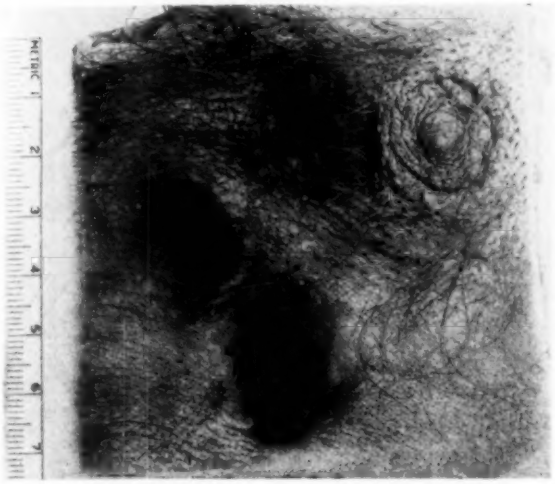

Fig. 1. Bullet wounds. Lower wound is No. 1, upper (near nipple) wound 2, and that on the left, wound 3.

matic) was recovered from under the skin of the back in the twelfth subcostal space in the midline. Number 1 bullet (25 calibre automatic) was removed from under the skin of the back 1.5 cm. to the left of the midline at the level of the eleventh thoracic vertebra. The midline fat in the region of the abdomen was 1 cm. thick. The surfaces of the abdominal cavity were smooth and dry. The spleen was in the mid-axillary line at the tenth rib. The liver was 4 cm. below the xyphoid and at the costal margin in the lateral aspect. The diaphragm was in the third intercostal interspace on the right and at the fifth rib on the left. There was a hematoma, 8 by 10 cm., in the anterior mediastinum on the left side. There were perforating lacerations of the pericardial sac corresponding to the wounds in the anterior chest wall already described. The pericardial sac contained 200 c.c. of clotted and fluid blood. The heart weighed 300 grams, and was firm, brown-red in color. There were two perforations of the right ventricle and one of the left ventricle (Fig. 2). Number 1 bullet wound of entrance was in the left ventricle, measured 10 by 8 mm. and was surrounded by a purple-red aura, the largest portion of which was 10 mm. in diameter. This wound was located just to the left of the interventricular septum at the junction of the middle and lower thirds and exposed a perforation in the posterior ventricular wall on the left side which measured 1 by 1 cm., located 1 cm. from the interventricular septum 2 cm. below the base of the heart (see Fig. 3). There was a perforating stellate laceration of the lateral wall of the aorta, which measured 3 by 2 cm., located at the level of the body of the eleventh thoracic vertebra on the left side. Number 2 was in the right ventricle 2 cm. from the interventricular septum at the level of the junction of its upper and middle thirds. This wound was 7 by 7 mm. in its largest diameter, exposed a laceration of the base of the bicuspid valve and a perforation in the left ventricle just below the base 2 cm. to the left of the interventricular septum. The latter perforation measured 8 by 13 mm. and was surrounded by a purple-red aura, the largest portion of which was 7 mm. in diameter. Number 3 bullet wound of entrance was in the right ventricle 1 cm. from the interventricular septum at the level of the middle and lower thirds. This wound measured 4 by 6 mm. and was located at the junction of the middle and lower thirds of the interventricular septum, and exposed a perforation 14 by 7 mm. in the posterior wall of the right ventricle at the interventricular septum 1.5 cm. below the base of the heart. This bullet passed through and through the right ventricle (Fig. 3). Examination of the lungs revealed far-advanced ulcero-caseous tuberculosis of both lungs and older fibro-caseous, and fibro-calcareo-caseous tuberculosis, in the apices of both lungs and the tracheo-bronchial lymph nodes. There was an obliterative fibrous pleuritis on both sides. Examination of the organs of the abdominal cavity revealed post-hemorrhagic softening of the liver, kidneys and spleen; pallor of the mucous membrane of the esophagus; postmortem autolysis of the mucous membrane of the remainder of the gastrointestinal tract. The mucous membrane of the urinary bladder showed no remarkable changes. Examination of the pancreas and adrenals showed only postmortem changes.

Anatomic Diagnosis: Multiple (three) bullet wounds of the chest with two perforating lacerations of the right cardiac ventricle and one of the left cardiac ventricle, extensive laceration of the aorta over the eleventh thoracic vertebra; hemopericardium; post-hemorrhagic softening of the myocardium, parenchymatous organs and spleen; bilateral obliterative fibrous pleuritis; bilateral ulcero-caseous and fibro-calcareo-caseous pulmonary

tuberculosis; fibro-caseous and calcareo-caseous tuberculous tracheo-bronchial lymphadenitis; bilateral diffuse bronchiectasis.

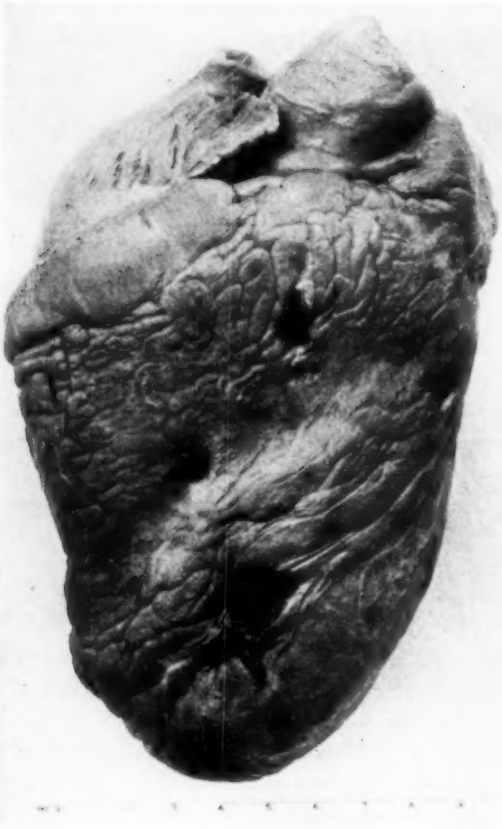

Fig. 2.

Fig. 3.

DISCUSSION

The literature contains numerous reports of penetrating wounds of the heart which were not immediately fatal. B. M. Vance[3] relates 3 unusual cases of bullet wounds of the heart showing attempts at healing. He refers to Henri ab Heers who, in 1647, reported the case of a patient who survived for seven days after penetration of the heart by two bullets. Vance also reports a case of a young adult male, who suffered a bullet wound of the chest 2 inches to the right of the left nipple, slightly above its level, who survived for eight days. The wound of entrance measured 5 mm. in diameter. The bullet entered the chest causing perforating laceration of the pericardial sac, anterior surface of the right ventricle just below the pulmonary artery ring, one of the pulmonary cusps, left auricle and the thoracic aorta. Death resulted, presumably, from recent separation of the edges of the wound in the right ventricle, probably because of some sudden rise of intracardiac pressure which the newly formed granulation tissue was unable to sustain. Vance also reports an incidental finding in a case in which death followed skull fracture with cerebral laceration. A circular fibrous scar was found over the most dependent portion of the right auricle. This scar measured ⅜ inches in diameter and occupied the entire thickness of the auricular wall, being visible on the epicardial and endocardial surfaces. This was evidently the point where a bullet had entered the heart, several years before death, penetrating about ¾ inch finally to lodge in the muscle of the right ventricle just below the ring, just under the epicardium. P. D. White[4] reports a case of bullet wound of the anterior mitral

cusp producing pure mitral regurgitation followed by enormous eccentric hypertrophy of the myocardium. Death resulted several years later from congestive heart failure. A. Piga[5] reports a case of suicide from ten fatal wounds in the heart and two serious wounds in the neck, all inflicted with a kitchen knife. Of the heart wounds, seven were in the right ventricle, two were in the left ventricle. Nothing was said in this report about the time of survival, or whether these wounds opened into the chambers of the heart. In the same paper Piga quotes a report on "Time of survival" of 235 cases of wounds of the heart from a study of Malanessena. In one case the individual survived for fifteen minutes following three wounds of the left ventricle and seven in the lung. The type of weapon or the extent of the wounds was not mentioned. Malanessena's report is as follows:

Time of Survival	R. Ventricle	L. Ventricle	R. Auricle	L. Auricle	Wall
One day: some hours					
1–6 hours	12	15	4	2	7
7–24 hours	9	10	2	0	3
1–30 days	7	0	5	1	4
30 days–one year	48	32	5	1	18
More than one year (unlimited time)	6	6	1	0	7
	93	67	17	4	52

Individuals with wounds of the cardiac auricles survive for a shorter time than those with wounds of the ventricles. This is probably because of the relatively small amount of contractile muscle tissue in the auricles. Also, wounds in the auricles are usually in the form of gaping tears rather than sharp punctures which precludes narrowing of the wound by contracture of the muscle in the auricle. Those with wounds of the left ventricle and right ventricle survive about the same length of time. Apparently the difference in blood supply and blood pressure between the right and left ventricles is offset by the resistance to puncture wounds caused by the thickness and firmness of the muscle of the left ventricle. Also, the path the bullet usually makes in the left ventricle plays some rôle. The amount of muscle in the left ventricle and its firmness cause some deflection of the bullet, thereby producing an oblique wound. The obliquity of the wound tends to inhibit the escape of blood from the left ventricle to the pericardial sac because the diameter of this type of wound is not the same throughout its path. The difference in diameter of the wound and its direction permit the narrowest parts of the wound to form a "flap-like valve." This would be effective in lessening the amount of hemorrhage during systole. There would also, however, be some beneficial effect in controlling the hemorrhage during diastole. Any method of decreasing the amount and rapidity of hemorrhage, would, of course, postpone the onset of heart tamponade, the most frequent cause of death in injuries of the heart, according to Singleton.[11] G. Fischer[6] collected 452 cases of which 401 were heart wounds, 51 wounds of the pericardium; the result of various types of injuries. He estimated that 30 per cent of the wounds involving the pericardium alone and 10 per cent of the heart wounds tend to undergo spontaneous healing. C. F. Wrightman[7] reported a case of stab wound of the anterior chest wall causing a vertical incision in the right ventricle with death following five days later. C. E. Lee[8] describes a case of heart block due to a shell fragment and gives the *x*-ray and electrocardiographic findings. P. Schmidt-Weyland[9] reports a case of total heart block occurring thirty-six years after bullet wound of the heart. R. Vargas Molinare[10] reports a case of recovery following suture of wounds of the left ventricle.

The immediate effect of penetrating bullet wounds of the heart depends chiefly upon the calibre of the bullet. Wounds of the heart resulting from bullets of small calibre, as commonly used in suicides, may

be survived long enough to allow the firing of a second and third shot.[1] Haberda[2] suggests that small bullet wounds of the heart may heal spontaneously. He describes a case of suicide with two penetrating bullet wounds of the heart, one of which passed through the right, the other through the left ventricle. In another instance, that of an unquestionable suicide of an old army officer, there were, in addition to two penetrating wounds of the head, one of which had severed both optic nerves, three wounds in the chest. One wound went through the left lung and two wounds through the left ventricle of the heart and the aorta. Haberda presumes that the wounds in the head preceded those through the lung and heart. Haberda illustrates also a case of a suicide who had five bullet wounds in the skin of the chest. Two different revolvers were used in this suicide.

The cause of death following heart wounds with survival for some time is described by A. O. Singleton.[11] According to Singleton heart tamponade is the most frequent cause of death. Death from this condition may occur early or late. Early tamponade occurs when the wound in the pericardial sac or overlying tissues becomes occluded by blood clots; or escape of blood to the pleural cavities is prevented by fibrous adhesions. Death from heart tamponade may occur late, either because of tears in the partly healed puncture wound of the heart, as described by Vance,[3] or as a result of pericarditis. The pericarditis arising from hemopericardium which may become suppurative. Next in frequency is death from hemorrhage, the injury to the heart being of such extent or location as to preclude controlling the hemorrhage, and finally death from heart wounds may be caused by heart block, or by embolization.

SUMMARY

The unusual feature of the case presented is the multiplicity of bullet wounds of the heart, self inflicted, any one of which would appear to be immediately fatal. The motives for suicide were apparently poverty and far-advanced pulmonary tuberculosis. Penetrating wounds of the heart may heal spontaneously and death may occur later from another cause independent of the former heart injury.

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CASE REPORTS

OSSIFICATION OF THE THYROID GLAND*

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OSSIFICATION in the thyroid gland is of importance not only because of the comparative rarity of the condition but also an account of the speculative interest on the part of pathologists regarding its pathogenesis.

Bell in 1895 described a tumor of the neck which was producing esophageal obstruction. This proved to be a calcified adenomatous mass which showed ossification in its cortex. Pennell, in 1916, reported, under the title of "Thyroid Stone," the case of a patient, forty-five years of age, who came complaining of aphonia of three months' duration. There was a small hard lump on the region of the left lobe of the thyroid gland. At operation this seemed to be a completely calcified adenoma. No mention is made of subsequent histologic study, hence the possibility of ossification was not entirely excluded. Willy Meyer in the same year reported an example of ossification of the thyroid gland, found incidentally at autopsy, in a man who had died of influenzal pneumonia. Seelig, 1925, reported a very interesting case of massive bone formation in the thyroid gland, which had occurred in a man of fifty-two years of age and which was associated with a complete block of the sympathetic trunk in the neck. There was complete recovery following lobectomy.

Meyer reviewed the literature and found that similar cases of true bone formation in the thyroid had been reported by Adami, Ewing, Ziegler, MacCallum and Aschoff. These writers were of the opinion that the lesion was very rare. Sehrt, Hunziker and Pfeister, on the other hand, state that in their experience ossification of the thyroid gland was fairly common. The consensus of opinion, from the literature, however, favors a belief in the rarity of this lesion.

CASE REPORT

A matron, fifty-three years of age, was admitted to the hospital, July 24, 1933, complaining of shortness of breath, difficulty in swallowing and on occasions a sensation of choking. She had noted a small hard lump in the neck. These symptoms had been present for only a few months but had been increasing in severity. Twenty-five years ago she remembers that she had a generalized swelling in the right lower region of the neck which gradually subsided leaving a small lump about the size of a plum. This had persisted but had given no trouble until recently when choking and difficulty in swallowing appeared.

The family history is irrelevant and the past history unimportant.

The physical examination was essentially negative except for the presence of a small hard irregular mass, $1 \times 1.5 \times 2$ cm. in diameter, located in the region of the right lobe of the thyroid gland. The mass moved with deglutition and appeared to be the right lobe of the thyroid gland. Examination of the larynx shows the vocal cords functioning normally. The heart, lungs, abdomen, pelvis and extremities presented nothing abnormal. The systolic blood pressure was 130 mm. Hg

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and the diastolic blood pressure was 90 mm. Hg. The pulse was 90 beats per minute and the temperature 98.2°F.

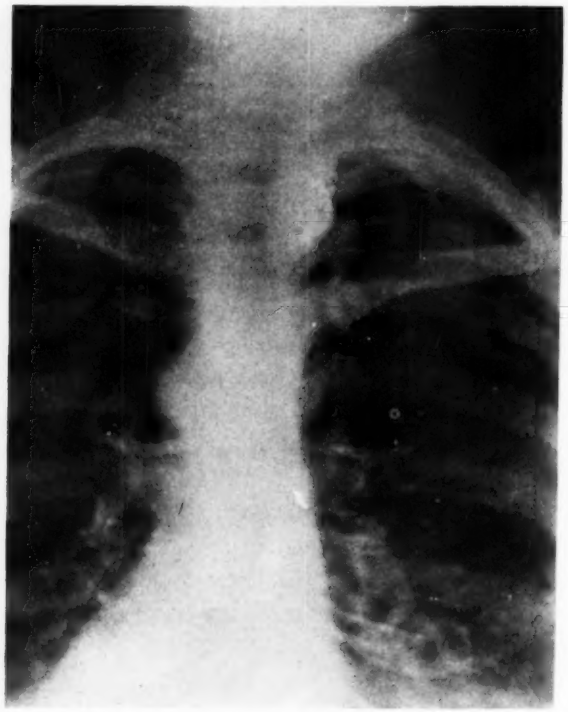

Fig. 1. Roentgen appearance of degenerated adenoma of thyroid gland exhibiting ossification.

Urinalysis showed a specific gravity of 1.010, and acid reaction, albumin and sugar negative and the microscopic revealed 2–3 leucocytes to the high power field. Examination of the blood gave a hemoglobin of 16.6 gm. a color index of 1.4, clotting time two minutes, erthyrocytes 4,544,00 and leucocytes 9780. The differential count was normal. The blood calcium was 10 mg. in 100 c.c. of serum. The basal metabolic rate was −20 per cent.

A roentgen ray of the neck and upper mediastinum in the anteroposterior plane revealed the calcified mass to the right of the trachea as shown in Figure 1.

A diagnosis of calcified adenoma was made and lobectomy was advised. Accordingly, on July 20, 1933, under local anesthesia (.5 per cent novocaine solution) a lobectomy was performed, and the mass which enucleated readily from a very much-thinned capsule appeared to be completely calcified. Practically the only parenchymatous tissue remaining was a small bit 1.5 × 1 × 1 cm. at the upper pole.

Convalescence was entirely uneventful. The patient commented repeatedly the following day on the ease which she could breathe and swallow. She was dismissed on July 31 and

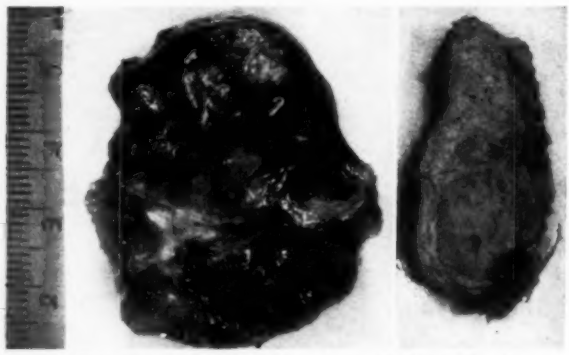

Fig. 2. Gross specimen of degenerated thyroid adenoma showing ossification.

advised to take thyroid extract grain i, daily. She returned six months later for examination at our request. She was in the best of health and stated that her previous symptoms were completely relieved. Her basal metabolic rate was −10 per cent.

The pathologic specimen appeared to be a calcified lobe of the thyroid gland and measured 4.5 × 4 × 2 cm. (Fig. 2). It was decalcified and the sections were stained with hemotoxylin and eosin. These revealed areas of true bone formations (Figs. 3 and 4). The piece of parenchymatous tissue removed at the upper pole, microscopically showed areas of hyperplasia and interstitial round cell infiltration and large areas of a fairly marked fibrosis. Dr. W. D. Collier examined the sections and commented as follows: "The most unusual finding in the section is true bone formation. There are quite numerous but very small spicules of bone scattered throughout the areas of calcified fibrous tissue. No spicules were found not joined to calcified fibrous tissue. The distinction between the two kinds of calcification is exceedingly clean cut and the exact dividing line between the calcified fibrous tissue and true bone formation is quite apparent. This bone has no peculiar histological characteristics. It does not contain Haversian systems but contains the usual sized bone lacunae containing bone cells. The spacing of the lacunae is only a little irregular. The matrix is quite normal in appearance. Occasionally the bony spicule is formed about a space containing large fat cells and a patchy sprinkling of cells suggesting myeloid formation. The acid decalcifying agent makes the staining reactions

a little too unreliable to state whether these foci of cells are all lymphocytes or whether some are normoblasts. No myelocytes were

Fig. 3. Photomicrograph of area of ossification in old degenerated thyroid adenoma; note type of bone formation; lacunae, bone cells, matrix. (Hematoxylin and eosin, × 120.)

present so the area should probably not be considered a true marrow. Two similar fatty areas with small round cells were found in cysts surrounded by calcified fibrous tissue. As usual, the bone deposition has a definite relation to vascular supply and is usually found to be formed where and only where a vessel is to be found."

DISCUSSION

Moschcowitz in discussing the paper of Willy Meyer stated that after a study of various forms of calcification and ossification he had come to the conclusion that in the majority of instances the abnormal ossification had occurred in tissues which had undergone necrosis and hyaline degeneration and in which depositions of lime salts had occurred. The actual mechanism of such ossification, he believed, lay in the formation of new blood vessels in such manner that the cellular com-

Fig. 4. Photomicrograph of same area as shown in Figure 3, under higher (× 320) magnification.

ponents involved in the process of angiogenesis became the progenitors of the cellular constituents of bone. He did not think a blastomatous or teratomatous origin probable.

There is, however, considerable disagreement among pathologists as to the exact pathogenesis of pathologic ossification. Wells after describing the manner in which, according to him, depositions of calcium takes place in the tissues, states:

From the beginning of the calcium seems to be deposited as carbonate and phosphate in about the same ratio as in mature bone. There seems to be no essential difference between the process involved in normal ossification and in most instances of pathological calcification. Any area of calcification may be changed to true bone in the course of time. Calcium salts seem to exert a specific influence on con-

nective tissue cells causing them to form bone; without this stimulus they cannot form bone, at least not readily and normally.

Heterologous ossification has occurred in practically every part of the body. Cases of ossification of calicified areas within the eyeball, of ossification of calcified nodules from the lungs, liver, mesenteric glands, heart valves and arteries have been reported.[2,7] It would seem, therefore, that calcification once it has taken place in pathologic tissue may, if a sufficiently long period of time supervenes, change to bone in a certain proportion of cases. The proximity or relation to normal osseous tissue is of no moment.

The case reported here is of particular interest in that some insight is afforded in the factor relative to the time required for the development of pathological ossification. This patient is known to have had an adenoma of the thyroid of perhaps twenty-five years' duration. Furthermore, she remembers that shortly after her marriage the enlargement in her neck became smaller and practically disappeared. She experienced no further trouble then until a few months prior to admission. It seems very likely now that some process of degeneration in her adenoma had begun at that time. Calcification and then ossification followed in the course of time and eventually symptoms of obstruction occurred as a result of the unyielding physical character of this body.

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MONO-AMNIOTIC TWINS

WITH BOTH UMBILICAL CORDS ABOUT THE FIRST TWIN'S NECK*

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TWINS always excite interest. Just how extensive and varied this interest is, can be seen by looking in any volume of the Quarterly Cumulative Index Medicus. The case I am reporting is noteworthy because (1) there was a single amniotic cavity; (2) the two cords were knotted together in a true knot; (3) one fetus was alive and the other macerated; (4) both cords were coiled so tightly about the live infant's neck that they had to be cut before it could be delivered.

Double ovum twins are separated by a membrane composed of 4 layers, two of amnion and two of chorion, and sometimes there are in addition two layers of desidua. Single ovum twins usually lie in two sacs, divided by a membrane composed of two layers of amnion. Only rarely is there a single amniotic cavity. For some unknown reason tubal twins are more apt to be mono-amniotic than twins developing in the uterine cavity. Of 38 cases of tubal twins critically reviewed by Arey, at least 9 had a single amnion. Only 2.7 per cent of monochorionic uterine twins are also mono-amniotic. Of uterine twins with single amniotic sacs there have been reported about 40 cases according to DeLee. However, Baumgart was able to find 85 cases in the literature and reported one additional case. Quigley is reporting a case at the coming meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons. According to Quigley, there have been only 8 cases reported in the American literature.

In the majority of cases of mono-amniotic twins, 54 per cent according to Baumgart, the two cords are intertwined or knotted together, which has a bearing on the fetal prognosis.

The fetal mortality is high. None of the American cases previous to Quigley's report had living children. In Quigley's case one child lived. Baumgart estimated that only 15 per cent of the children lived. This high fetal mortality is in part accounted for by prematurity. Only 8 cases of Piltz's series of 29 came to term. The interference in the circulation in one or both cords is the cause of other deaths.

The intimate association of the two fetuses in a single amniotic sac gives ample opportunity for bizarre entanglements and arrangements of the cords and the babies. In Podzahradsky's case, the cord of the second twin was about the neck of the first twin. It was tied and cut before the first twin could be delivered. The second twin was delivered by version and lived.

So far as I can determine from an incomplete review of the reported cases, my case is unique in that both umbilical cords were so tightly wound about the first baby's neck that both had to be cut before the baby could be delivered.

CASE REPORT

Mrs. J. A. B., white, aged twenty-five years, consulted me December 1, 1933. She gave a history of a six weeks' abortion in 1928 which was induced by a doctor. There were no complications. In July, 1932 she had a tubal abortion and was operated on by Dr. Frank Johns. Otherwise, her past history was negative, except that a maternal aunt had twins. The patient was the second of five children, all living. Her mother had aborted once at three months.

Menstrual History: The patient began to menstruate at sixteen years. The periods

* Read before the Manchester Medical Society.

occurred every twenty-eight days and lasted four days. The periods were usually painless. There had been a slight leucorrhea for several years. Her last menstrual period began September 21 and lasted the usual four days.

Her husband was well. He had had no skin eruption nor rheumatism. There were no twins in his family.

Physical Examination: Patient appeared to be in good health. She was 155.5 cm. (61½ inches) in height and weighed 45.44 kilos (103 lbs.). Pupils were equal and reacted to light. Throat was negative. Teeth were in good condition. Knee jerks were present on both sides. The shins were smooth and straight. Heart and lungs were normal. Breasts were moderate in size, soft and there were no striae. The areolae were enlarged, nipples prominent, no secretion. The abdomen was flat and of good tone. There was a mid-line scar, no tumors nor tenderness. The pelvis was justo-minor: sp. i. 19; cr. i. 24, trochanter 29½; Bordeloque 17½; ob. r. 19½; ob. l. 20; circumference 72; bi-ischial 8; ant. sagittal 5½; post-sagittal 7; antero-posterior 10, depth of symphysis 6, pubic arch 75°. Vaginal examination disclosed a nulliparous introitus, a pink mucosa, no discharge, a soft cervix, a soft anteflexed uterus that was a trifle enlarged.

The blood Wassermann was reported 4 plus. It was repeated on December 13. At that time it was 2 plus. I had examined the patient once previously on September 18, 1931 and her Wassermann then was negative. She was given a provocative course of mercury and potassium iodide on January 18, the Wassermann was 3 plus and on April 3, 1 plus.

The pregnancy was entirely normal. There was a moderate amount of nausea from November until February. The blood pressure ranged from 100 to 120 mm. Hg systolic and 60 to 85 diastolic. In April she had cramps in her legs at night, which were relieved after she took Blaud's pills. The urine was negative throughout. Her weight increased gradually from 45.44 kilos (103 lbs.) to 57.83 kilos (127½ lbs.) on April 17, when it remained practically stationary. On May 7 it was 57.95 kilos (127¾ lbs.). There was no edema except on April 23, when her feet were swollen.

On May 30, twenty-nine days before she was due by Naegele's rule, she began having pains at 3 P.M. and entered the Johnston-Willis Hospital at 7 P.M. She was then having pains every two to three minutes, lasting one minute. Her blood pressure was 140/90. The abdomen was so rigid that the fetus could not be outlined. Rectal examination showed a head deep in the pelvis. The patient was given 12 gr. of sodium amytal and 1/200 gr. of hyoscin. This apparently afforded her no relief and at 8:30 P.M. she was given ether-oil by rectum, which she expelled. A vaginal examination under inhalation ether anesthesia showed a tense bag of waters. This was ruptured and a quantity of dark blood-tinged fluid escaped. A small head presented in antero-posterior diameter and was lifted out with forceps. Two loops of cord were about the neck. I was unable to slip either loop over the head or over a shoulder. I clamped one loop and cut it between two hemostats. Much to my surprise I was unable to loosen the second loop. This was in turn cut between hemostats. Extraction was then easy. External rotation was to the right. Immediately after the delivery of the baby, a foot appeared and the second baby was delivered by gentle traction. Its cord was already cut and clamped with a hemostat. There was a small first degree laceration of the perineum, which was repaired with one longitudinal suture of silkworm gut.

The first baby cried spontaneously. It was 44 cm. long and weighed 2013 gm. (4 lbs. 7 oz.). The second baby was macerated. It weighed 1446 gm. (3 lbs. 3 oz.). Both were females.

The placenta was lifted out of the vagina by the two cords after it had separated. About 100 c.c. of blood was lost. The patient was given 1 c.c. of pituitrin.

The single placenta was discoidal in shape. The two cords were attached eccentrically and rather symmetrically some 8 cm. apart. They were intertwined and tied in a true knot 20 cm. from the placenta. One cord was brown and edematous, the other contained Wharton's jelly of normal transparency. There was no vestige of an amniotic partition. The placenta weighed 567 gm. (20 oz.).

The puerperium was afebrile. The patient was discharged from the hospital on June 7. At that time her baby weighed 1966 gm. (4 lbs. 5 oz.).

On July 7, postpartum examination showed patient to be well. Her weight was 50.58 kilos (111½ lbs.), blood pressure 100/70. Blood Wassermann negative. Heart, lungs and breasts were normal. Abdomen was flat, tone poor, many striae, no tumors, nor tenderness. The labia were in contact, perineum intact. The cervix was small and intact. The fundus was small and anteflexed. The baby weighed 2784 gm. (6 lbs. 2 oz.).

DIVERTICULA OF THE FEMALE URETHRA

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CHICAGO

URETHRAL pouches or diverticula have been described since 1814. The earliest reference is found in Sir Charles Mansfield Clarke's "Disease of Females." He states: "Sometimes a pouch forms in the posterior part of the urethra in which a few drops of urine lodge and from which situation it may be pressed out by the finger applied to the part." The majority of case reports are confined to urethral diverticula found in the male. This series of 6 cases of diverticula in the female were seen on the Gynecological and Urological services of St. Luke's Hospital since 1929. I am indebted to the members of these departments for the privilege of presenting these cases.

CASE REPORTS

CASE I. G. K., white, married, female, aged thirty years, entered St. Luke's Hospital (No. 251689) on November 21, 1929. She complained of a dull aching sensation in her bladder with pain on urination associated with a day and night frequency of from four to seven times. She had an occasional period of freedom from symptoms. No other complaints.

Past History: Marital: never pregnant. Family: Mother and sister died of tuberculosis. Surgical: Appendectomy 1920; kidney operation 1925.

On November 26 a lima-bean sized diverticulum of the urethra with its urethral opening 2 mm. from the external urethral orifice was dissected out. The diagnosis had been made clinically with no radiological help and the specimen removed at operation was apparently not sectioned. The patient left the hospital December 8, 1929 in good condition and almost completely relieved of her symptoms.

CASE II. H. R., white, married, female, twenty-seven years of age, entered St. Luke's Hospital (No. 258854) June 4, 1930. She complained of pain in the vagina and burning on urination for the past two years. She stated she also had noticed a growth in the vagina which had been giving her trouble in the past two years. She had no other complaints.

Past History: Marital: two pregnancies, one terminated by induced abortion and one by induction of premature labor at six months for convulsions. Surgical: Thyroidectomy.

Examination revealed a cystic swelling about 1½ by 1 in. in diameter situated behind the urethra at the bladder neck. This was dissected out June 5, 1930.

Histology (Fig. 1): These tissues are dense fibrous, continuous in certain portions into a narrow margin of vascular chronic granulation tissue. In some places there are large masses of extravasated red blood cells. In other places there are leucocytic infiltrations. The narrow transitional epithelium along one edge has desquamated considerably so that only small portions have a few of the surface cells.

The patient left the hospital ten days later completely healed.

CASE III. H. B., white, widow, aged thirty-seven years, entered St. Luke's Hospital (No. 270545) April 3, 1931. She stated she had noticed a white irritating discharge for the past eight months. She also thought there was an abscess in the vagina which filled and discharged periodically. She has had to get up once or twice at night to urinate during the past eight months. No other complaints.

Past History: Marital: two instrumental deliveries with severe lacerations. Operations: Repair of perineum 1921.

Examination revealed a soft cystic mass in the anterior vaginal wall about 2 cm. in diameter. Pressure caused a purulent fluid to exude from the external urethral orifice. The impression was that this mass was an urethral diverticulum.

April 7, 1931. Urethroscopic examination revealed the opening of the diverticulum on the floor of the urethra. An ureteral catheter was inserted a few centimeters. An urethrogram was made using sodium iodide solution (Fig. 2).

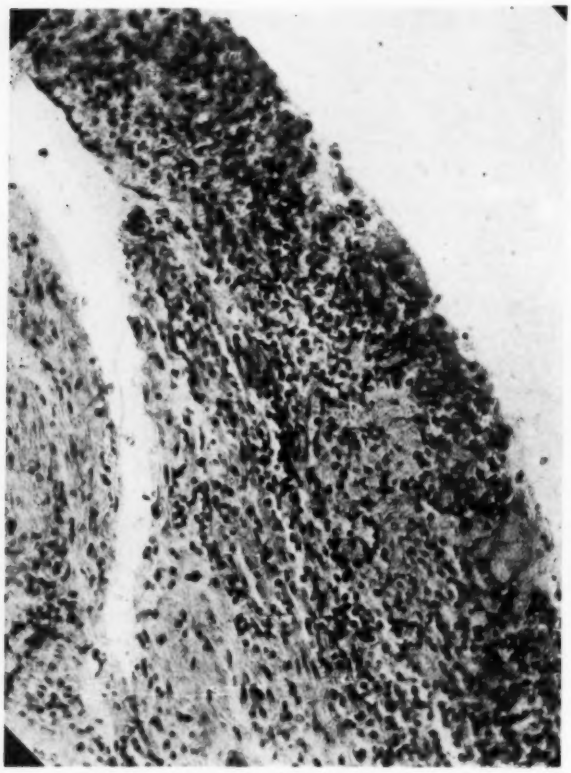

FIG. 1. Photomicrograph showing section of sac wall from Case II typical of walls of inflammatory sacs.

April 8, 1931. Dissection of the diverticulum under general anesthesia.

Histology: The tissues on the mucosal surface to a depth of about 3 mm. are cellular vascular chronic granulation tissue. On the surface is a fibrinous and leucocytic exudate. Disseminated in the granulation tissue are many polynuclear leucocytes. There is no epithelial covering along this edge. The deeper portions are dense and fibrous.

CASE IV. I. T., colored, female, aged thirty-seven years, came to St. Luke's Hospital, outpatient department (No. 71661) April 28, 1931. She complained of dull constant pain in the lower abdomen for the past six weeks. She had noticed a rather sharp pain, bearing down in character, for two months. This was accompanied by burning on urination but no other urinary symptoms. She also had noticed a vaginal discharge for four years. She had had one miscarriage at six months in 1914 and one normal delivery in 1917.

Physical examination revealed a well-nourished colored female not acutely ill. Pelvic examination revealed bilateral thickening of the adnexa which were tender to palpation. The corpus uteri was nodular. In the anterior vaginal wall there was a soft mass 1 × 2 cm. Pressure on this mass caused an exudate of purulent fluid from the urethra. Both Skene's and Bartholin's glands were thickened.

FIG. 2. Urethrogram from Case III showing typical shadow of urethral diverticula.

The patient was admitted to the hospital for a gynecologic laparotomy but later refused to allow the dissection of the urethral diverticulum.

Patient was seen May 25, 1934. There was a soft cystic swelling in the anterior vaginal wall about the size of a walnut. She was having some burning on urination but no other complaints. She refused any further examination or treatment.

CASE V. M. F., aged fifty-four years, housewife, was seen in the hospital complaining of pain and swelling in the vagina. She had had two children with difficult labor and laceration. She had a vaginal discharge which was cured by a repair.

Examination revealed a cystic swelling in the anterior vaginal wall which exuded urine from the external urethral orifice on pressure. The diagnosis of the urethral diverticulum was made. The diverticulum was excised. Sections of the wall revealed essentially inflammatory changes.

Case vi. P. McA., colored, female, aged thirty-two years, was seen in the Gynecological out-patient department in 1933. She complained of severe backache and burning on urination with a dragging sensation in the urethra after the act. At that time a periurethral abscess was diagnosed which drained into the urethra. She entered the hospital one year later on April 19, 1934. Urethroscopy and urethrography confirmed the diagnosis of urethral diverticulum. The diverticulum was excised surgically.

Sections revealed a lining of stratified squamous epithelium. The stroma tissues are fibrous and include some skeletal muscle. There are also inflammatory exudates. Some of the fibrous tissues include smooth muscle (Fig. 3).

CLASSIFICATION OF URETHRAL DIVERTICULA

The usual classification which is followed by every one reporting instances of diverticula of the urethra is that of Watts.

Urethral Diverticula

A. Congenital.
B. Acquired.
   1. From dilatation of the urethra
      a. Due to urethral calculus
      b. Due to urethral stricture
   2. With perforation of the urethra resulting from
      a. Injuries to the urethra
      b. Rupture of abscesses into the urethra
      c. Rupture of cysts into the urethra.

HISTOLOGY OF THE FEMALE URETHRA

The length of the female urethra is about 25 to 30 mm. The mucous membrane forms longitudinal folds. It is lined with stratified squamous epithelium. In many cases, however, pseudostratified columnar epithelium can be found; numerous smaller and larger invaginations (lacunae) are formed by the epithelium. The outpocketings in their wall are lined in many places with clear mucous cells, as in the glands of Littré in the male urethra. The glands may accumulate colloid material in their cavities or may even contain concretions.

Fig. 3. Photomicrograph showing section of sac wall from Case vi. Notice epithelial lining and muscular structures in wall.

The lamina propria, devoid of papillae, is an irregularly arranged connective tissue with abundant elastic networks. It is provided with a highly developed system of venous plexuses and has therefore a cavernous character.

The mucous membrane with its veins is surrounded by a thick mass of smooth muscles.

EMBRYOLOGY OF THE URETHRA

Embryologically the vesico-urethral anlage enlarges and transforms into the bladder and into either the entire female urethra or the prostatic and membranous male urethra.

Male	Indifferent Stage	Female
1. Prostatic and membranous urethra	Urogenital sinus	1. Urethra and vestibule
2. Cavernous urethra		2.
3. Prostate gland		3. Para-urethral ducts
4. Bulbo-urethral gland		4. Vestibular glands

Embryos of ten weeks are at the beginning of the definitive stage. In the male, the edges of the urethral groove progressively fold together and thus transform the open urogenital sinus into the tubular urethra. The scrotal swellings shift caudad to their final position where each becomes half of the scrotum, separated from its mate by the raphe and underlying septum scroti. In the meantime, the shaft of the penis elongates, and by the fourteenth week, the urethra has closed as far as the glans. The urethra is then continued along an epithelial plate which represents a solid part of the original urethral anlage incompletely partitioning the glans; by splitting, the plate is first converted into a trough which promptly recloses into a tube that continues the urethra to the definitive opening at the tip of the glans.

Changes in the female are less profound, yet slower. The phallus lags in development and becomes the clitoris with its homologous glans clitoridis and prepucium. The shorter urethral groove never extends onto the glans as in the male. It remains open as the vestibule. The urethral folds which flank the original groove constitute the labia minora.

Suter explains the embryological defect leading to the formation of congenital diverticula in this way. The urethra takes its origin from the genital furrow which, covered with epidermal epithelium, forces its way into the position which it is to occupy later as the urethral canal. This canal, at first partially open, has at this time a communicating bridge of epithelium with the external surface. The epithelium of the canal becomes cylindric; that of the communicating epithelial bridge remains squamous. Normally the walls of the canal coalesce and become the urethra and the epithelial bridge is absorbed. It is the persistence of this communicating epithelial bridge that Suter believes is the cause of diverticulum formation or of dermoid.

Kaufman states that "in the male any diverticulum not in the pendulous urethra near or in the fossa navicularis cannot be of congenital origin." In the female, however, the absence of this highly differentiating area in the development of the urinary organs explains the failure of the development of congenital diverticula in them.

ETIOLOGY

Diverticula connecting with the female urethra have an acquired origin, usually from trauma from childbirth especially in difficult or instrumental labor, and from abscess cavities which have drained into the urethra and have subsequently failed to become obliterated. Routh thought their etiology might be: (1) closure of the ducts of pre-existing urethral glands; (2) blood cysts; (3) formation of pseudocysts by injury to the urethral floor during labor or instrumentation.

Tait thought they originated in an error of development, namely an offshoot resulting from a faulty union of the primal folds.

The etiology in Cases III, IV and V is obviously from one of the foregoing causes. The etiological factors causing the formation of the diverticula in the first two cases is obscure but from the histological picture all are apparently acquired although there are traces of epithelial elements in the sections of the diverticular wall from Case II.

In making a decision histologically between a congenitally formed diverticulum and an acquired one, we should, in the absence of secondary inflammatory changes, find the wall of the congenital urethral diverticulum containing those strata characteristic of mucous membrane,

namely epithelium, basement membrane and tunica propria.

Case VI is difficult to classify. The histology shows a sac wall which has all the requirements of one congenitally formed. However the history reveals the occurrence of an acute inflammation of the peri-urethral tissues which was diagnosed a peri-urethral abscess. Whether this was true or whether the peri-urethritis occurred around a sac already formed is difficult to decide. Dr. E. F. Hirsch, the pathologist at St. Luke's Hospital, suggested the possibility of the sac developing from traction on the urethra during contraction following the peri-urethritis, analogous to the development of traction diverticula of the esophagus.

SYMPTOMATOLOGY

The presenting symptoms of women with urethral diverticula are predominantly lower urinary in character. Burning on urination is common and is usually associated with an increased day frequency and occasionally nocturia. Occasionally there is bladder heaviness or suprapubic discomfort and a mild bearing-down sensation or urination. If the diverticulum becomes moderately large the patient may herself notice the swelling. Commonly some associated pathology produces symptoms such as the vaginal discharge from an endocervicitis and the low abdominal pain and low backache from adnexal disease. In no case was there hematuria and in all the urine had become infected.

DIAGNOSIS

The diagnosis is relatively simple if the condition is kept in mind during an examination to determine the cause of lower urinary tract complaints. If the patient has already noticed the swelling it is simple to orient it anatomically. In the urinary tract study, the bladder and higher urinary tract must not claim the entire attention as many urethral lesions will be overlooked. Urethroscopy will reveal the diverticular opening. An ureteral catheter can be inserted and the diverticulum easily defined on the urogram by injecting with any of the usual radiopaque media.

TREATMENT

The treatment is entirely surgical. To attempt to aid healing by the injection of irritant chemicals is merely a waste of time and may prove dangerous. It is a simple matter to dissect out the sac under a general anesthesia. To aid healing the bladder is drained by an inlying small Pezzer catheter for from five to seven days. The bladder and the urethra receive daily injections or irrigations to control infection. The postoperative course is uneventful, the patient leaving the hospital by the tenth postoperative day.

CONCLUSIONS

1. Urethral diverticula in the female are not uncommon.
2. They are acquired either from inflammatory processes or trauma.
3. The marked difference in the embryology of the urethra explains the rarity of congenital origin.
4. A new factor in their production, that is, traction, is suggested.
5. The diagnosis is simple if the possibility of its occurrence is kept in mind.
6. Urethroscopy and urethrography clinch the diagnosis.
7. Excision of the sac is the only regional therapy.

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WILLIAM RAWLINS BEAUMONT

WILLIAM RAWLINS BEAUMONT was born on Beaumont Street, Marylebone, London, in 1803. His family originally came from France and settled in England in the 14th century.

He was educated in various private schools from which he entered St. Bartholomew's Hospital, London. There, he attracted the attention of John Abernethy, who appointed him his dresser. He also studied under such distinguished men as Sir Astley Cooper, Lawrence, May and Hall.

From St. Bartholomew's Beaumont went to Paris where he remained ten months. He spent a great deal of time with the renowned teacher, Amussat, a mechanical genius, who developed in Beaumont his talent for designing surgical instruments. From Paris he went to the University of Brussels. Then, he returned to London. On December 23, 1826 he passed the Royal College of Surgeons' examinations and became a Fellow in 1836. In that year he invented an instrument for suturing in the operation for cleft palate. The *Lancet* expressed the opinion that "this instrument was destined to make an epoch in the world's history," and so it did, for it served as the model for the Singer Sewing Machine Company.

About this time, Beaumont designed instruments for tying polypi, a sutrum, and many others of surgical value. His collection of casts and instruments may still be seen at the Royal College of Surgeons, England, but all instruments made by him in Canada and presented to the General Hospital have been lost.

Beaumont practiced a short time in London where he was surgeon to the Islington Infirmary. But he was anxious to enter the Army Medical Service. He was pulling many strings to gratify this wish, when a friend announced he was about to sail for Canada, and suddenly Beaumont made up his mind to accompany him.

He arrived in Canada in 1841, and took up his residence in Toronto. A clever surgeon, he prospered. In time he became known as "Beaumont of Canada."

In Canada, where he lived the rest of his life, he held many important positions. In 1863 he succeeded Dr. Widmer as consulting surgeon to the General Hospital.

He was the author of many articles, some of which deserve mention: "The Treatment of Fracture of the Leg and Forearm by Plaster of Paris" (1831); "On Polypi" (1838); "Tumour of the Lower Jaw" (1850); "Clinical Lectures on Traumatic Carotid Aneurysms" (1854); "The Several Forms of Lithotomy" (1857); "A Deeply Penetrating Wound through the Orbit with Recovery" (1862). Most of his writings were published in the *Lancet*.

His last days were clouded with much suffering. In 1865 he lost the sight of the left eye. However, he continued his surgical work until eight years later, when the right eye became sightless. He then went into seclusion, saw few of his old associates, did not visit his usual haunts, and died on October 13, 1875.

T. S. W.

[From Fernelius' Universa Medicina, Geneva, 1679.]

BOOKSHELF BROWSING

ROBERT JAMES GRAVES*

CHESTER E. STELLHORN, M.D.

BROOKLYN, N. Y.

ONE hundred years ago, on May 23, 1835, an Irish physician described[1] the association of "rapid pulse, weakness on exertion, enlargement of the eye balls with protrusion and a tumor of the thyroid gland." Today the tyro in medicine recognizes that syndrome as hyperthyroidism or Graves' disease. Graves was not the first to describe the disease, having been preceeded by Parry (1786)[2] and Flajani (1800).[3] The description of von Basedow (1840)[4] introduced the disease to physicians of continental Europe and by some is considered superior to that of Graves in points of accuracy and detail. In the years which have followed, anatomists, physiologists, chemists, physicians and surgeons have added, bit by bit, their research findings until today it stands as one of the best understood of all diseases. The surgeon rightfully claims this disease as lying within his especial province.

Who was this Dr. Graves whose name is known to everyone but of whom those of our day know so little? His numerous writings, although in our own tongue, grow dusty as they sleep undisturbed upon the shelves of our libraries. Can it be that his writings, which in their day enjoyed wide fame, have no message to our own age? Is it mere accident that his name and memory are kept alive by an eponym?

Robert James Graves was the son of Richard Graves, Senior Fellow of Trinity College (Dublin) and Regius Professor of Divinity. More remotely he was descended from an English officer in Cromwell's army. He was born in Dublin in 1797 and at an early age showed indications of that energy and activity of mind which so distinguished him in after life. While still a schoolboy he established and published a weekly paper containing school news and leading articles. Dr. Magee, who later become Archbishop of Dublin, greatly admired and encouraged the talent displayed by this early journalistic effort. Many years later we find him assisting in the founding of another periodical, *The Dublin Journal of the Medical Sciences;* for many years he was a valued contributor to its pages.

* From the Department of Surgery, Cumberland Hospital, Brooklyn, N. Y., Dr. John E. Jennings, Director.

Graves' education was acquired at Trinity College, Dublin, where he received his A.B. and M.B. degrees in 1815 and 1818 respectively. He was the recipient of many scholastic honors, not confined to any single department of study. His facility in foreign languages was remarkable. Such a brilliant mind would probably have attained high distinction in any path of life he chose to pursue; his catholicity of talent was conspicuous in his professional, humanitarian and artistic attainments. Dr. J. F. Duncan says:[5]

. . . This was, in fact the foundation for his success and the very quality which fitted him for the Professorship. The practical physician who delights to exercise his skill at the bed of suffering, frequently has no taste for the slow and difficult investigation of abstract scientific problems; while the man who shuts himself up in the laboratory or dissecting room in the calm pursuit of learned study, shrinks with aversion from the drudgery of the hospital with its anxieties, its dangers, its responsibilities. Then again, each of these, however eminent in their peculiar path, may be deficient in the clear and ready utterance—in the charm of voice and manner of speech, without which no man, however learned, can make an efficient and attractive lecturer. It was Dr. Gaves' good fortuner to be capable of filling all these several positions with ease and acceptability.

Fig. 1. Robert James Graves. From a woodcut by C. Grey, etched by J. Kirkwood.

Following his graduation, Graves spent three years in postgraduate study at the important medical centers of England and the continent. He had a number of thrilling adventures while on this tour. While traveling on foot through Austria, having neglected to carry his passport, he was arrested as a German spy. He protested vigorously, stating that he was a British subject. The authorities, however, would not believe him because they felt certain that no Englishman could speak German as perfectly as he did. He was imprisoned ten days, suffering great hardships.

An oft-related anecdote tells how his fortitude and presence of mind averted a disaster on the Mediterranean Sea. He and

Fig. 2. Meath Hospital, Dublin. The older portions, at the extreme right, were built in 1822; there Graves delivered his famous Clinical Lectures.

a poor Spaniard were the only passengers on an ill-found ship, poorly manned and badly commanded by Sicilians. A gale arose which tore the sails, the vessel leaked, the pumps choked and the crew in despair prepared to abandon the ship in the boat. Graves stove in the boat with an axe to prevent their escape and assumed command of the ship. He had the pumps repaired with leather from his own boots, the crew returned to work, the leak was gained upon and the vessel and all aboard were saved.

While on this tour he became acquainted with many physicians and physiologists with whom he kept up correspondence throughout his life. A similar friendship was made with J. M. W. Turner, the landscape artist. Their meeting occurred when Graves was traveling by diligence across the Alps. At one of the post stations a rough-looking person took a seat beside him. Graves watched with curiosity and growing interest as his companion drew from his pocket a notebook and rapidly sketched the outlines of the clouds as they traveled along. Graves himself was an artist of some ability and he concluded that the stranger was no ordinary man. Soon they began to converse, became acquainted and decided to travel and paint together. Graves himself described how, having fixed on a point of view, he and

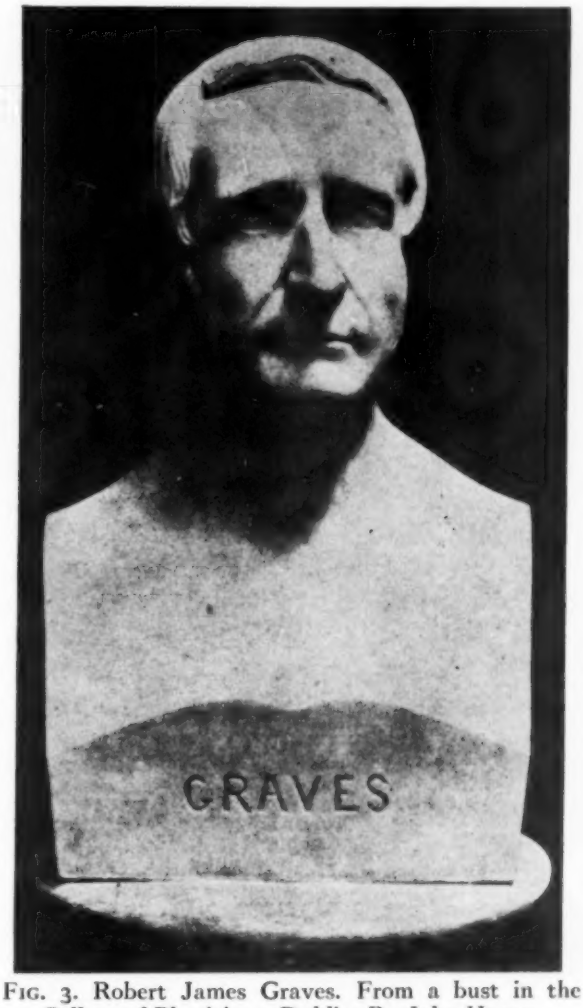

Fig. 3. Robert James Graves. From a bust in the College of Physicians, Dublin. By John Hogan.

Turner sat down side by side to their work[6]:

> I used to work away for an hour or more and put down as well as I could every object in the scene before me, copying form and color, perhaps as faithfully as was possible in the time. When our work was done and we compared drawings, the difference was strange. I assure you there was not a single stroke in Turners' drawing that I could see like nature, not a line nor an object and yet my work was worthless in comparison with his. The whole glory of the scene was there.

Dr. Wm. Stokes comments on this: "The tone and fire with which Graves

uttered these words spoke volumes for his sympathy with and his admiration for the great painter of nature."

It is a curious fact that these two remarkable men lived and traveled together for several months without either of them inquiring the name of the other and not until they reached Rome did Graves learn that his friend was the great artist. Evidently, painting ever remained an avocation for Graves. Mr. William Clifford,[7] librarian of the Metropolitan Museum of Art, was unable to find any mention of Graves in the biographical dictionaries of artists nor to locate any of his paintings in the catalogue of the Museum.

Returning to Dublin in 1821 Graves became one of the founders of the New School of Medicine in Park Street, he was elected physician to the Meath Hospital and appointed a lecturer at Sir Patrick Duns' Hospital. Graves was beginning his life work at a time when Irish national spirit was at a low ebb. In 1800 the Act of Union destroyed Irish parliamentary rights. During the generation which followed, "Ireland's great men, one by one, had disappeared, her orators were silent, her advocates unheard unless feebly and in another place and her young men were apathetic." Strange it is that seemingly purely physical and political events should influence intellectual courses. A period of at least one generation was necessary for the development of those energies and movements characteristic of healthy growth.

William Stokes commented, philosophically, on the relation of the environment to the man by noting.

> . . . two elements in the progress of human knowledge, two sources of advancement which are separate though mutually reactive. One is a general influence affecting, it may be, simultaneously or near simultaneously many men in a community. Its beginnings are obscure, often hidden, its progress slow, its action unperceived even by those who unconsciously bend to its influence but its operations are extensive. It produces great but not the greatest results and seems rather to prepare the way for what is to come, than to be its immediate cause. The birth of the other is widely different though in a sense it is consequent on the first. It is recognizable, distinct, sudden, solitary. The chronicles of arms, art, literature, science—all tell of the silent but broadcast sowing of the seed which at last in some favored instance and at its appointed time, bursts into manifest and majestic life and the tree overshadows the plain and the fowls of the air come to rest in its branches. I want to convey to you what I believe to be true, that his [Graves'] labours, his life—mark, if not a culminating point, at least an era in the history of Irish and I may say British medicine.

One of the greatest contributions of Graves to modern medicine was his complete change in the method of teaching the medical students. In his introductory lecture to the students of the Meath Hospital, delivered in the fall of 1821, he outlined his ideas:[6] "From the very commencement the student ought to witness the progress and effects of sickness and ought to persevere in the daily observation of disease during the whole period of his studies." This system of bedside teaching probably arose in Germany and spread to Italy where Graves saw its advantages as practiced by Maurizio Bufalini of Florence. The introduction of this method of teaching into English-speaking countries is entirely due to the efforts of Graves. Like all things new, it met with much opposition and ridicule.

> The[9] impassible gulf, which in that aristocratic era lay between the student and his so-called teacher was, by Graves, made to disappear and for the first time in these countries was the pupil brought into a free and full and friendly contact with a mind so richly stored that it might be taken as an exponent of the actual state of medicine at the time—a mind ardent in research, fruitful in discovery and yet no miser of its wealth but ever ready to pour forth its riches to all and for all who were ready to receive them.

Graves was also instrumental in having the instruction given in English, for as

late as 1831 in most hospitals the classes were conducted in Latin, probably of a corrupt sort, for Graves says, "I have called the *language* Latin, in compliance with the generally received opinion of its nature."

His lectures are said to have been startling in their impressiveness, his language forcible, elegant, and frequently eloquent, though "he never lost sight of his text in the froth of a metaphor." In them he gave instruction "not as water from a well but as from a flowing stream, his facts, views and arguments were vital and refreshing because constantly renewed from year to year without reference to previous notes. He excited in his students the feeling that he remained a fellow student in community of pursuits, similarity of mind, we might almost say in years."

In his lectures he warned against the evils of defective training and deplored the system whereby the student became a full Doctor, "a practitioner who has never practiced." Also, the student should "learn the duty as well as taste the pleasure of original work." His pointed remarks did much to end the coarse, harsh and even vulgar treatment of the charity patients by the attending physicians and students.

Graves' ability as a teacher and as a physician won rapid recognition. He was chosen a member of the College of Physicians in 1823. He was made King's Professor of the Institutes of Medicine at Trinity College in 1827 and held this position until 1841; at the same time he continued his clinical lectures at the Meath. In 1828 he took a leading part in founding the Dublin Pathological Society and was the first President. He received his M.D. in 1841. He was made an honorary or corresponding member of most of the leading scientific societies of the continent. In 1843 and 1844 he was chosen President of the College of Physicians; he was elected Fellow of the Royal Society in 1849.

No new improvement in clinical methods escaped Graves' observation. When the (then) new science of auscultation was being advanced, Graves and Stokes espoused it, defending the stethoscope from an attack by Dr. Clutterback. Their reply[10] refers to Dr. Clutterback's lecture as an "irritable effusion." " . . . His joke about auscultation as equal to mesmerism and homeopathy, comes with a bad grace from one, himself the author of an unphilosophical and exploded theory of fever." And again: "We suspect Dr. Clutterback's sense of hearing must be injured; for to him the 'ear trumpet' magnifies but distorts the sound, rendering it less distinct than before."

Dr. Graves' "Clinical Lectures"[11] show the eclecticism of his medical doctrine. Their clear style and valuable therapeutic innovations were much admired by that great French physician, Trousseau,[11] who entreated those of his pupils who could read English, " . . . to consider them as their breviary." The Lectures are a veritable encyclopedia of clinical medicine, they passed through several English editions, at least three American editions and were translated into German, French and Italian. The two leading subjects are cholera and fevers. Many epidemics of typhus fever passed over Ireland and furnished Graves with ample material for study. He was less concerned with the etiology and differentiation of the various "fevers" than in their symptoms, progress and treatment. He advocated the "feeding of fevers" which was contrary to the usual practice and was the cause of many heated controversies. There is considerable original work on the pathological and clinical aspects of nervous diseases; attention is drawn for the first time to the "pin hole pupil" of pontine hemorrhage and to the use of the watch in timing a pulse, as a diagnostic procedure. There too, are found early descriptions of angioneurotic edema and of scleroderma. One of his original ideas was a mode of treating hepatic abscess so as to "insure the patient against the risks consequent on the escape

of purulent matter into the cavity of the peritoneum." Graves' method is an example of medical conservatism applied to a surgical problem. It is of considerable interest to surgeons as its principles find their modern counterpart in the operation for brain abscess and the two-stage operations which are popular today. The case cited by Graves was that of an hepatic abscess. The surgeons saw the patient, felt that the signs were too diffuse and the situation of the abscess uncertain, so that the operation not only afforded little chance of success but might prove very detrimental; they accordingly refused to operate. It occurred to Graves that if an incision were made "within one or two lines of the peritoneum" and kept open with a packing, the abscess might tend toward and finally rupture through it. One of the surgeons, a Mr. MacNamara, finally consented to perform the operation as described. The result was awaited by Graves with much anxiety; two days later the patient sneezed and a large quantity of pus escaped, followed by rapid recovery of the patient. Graves and others used this method on additional cases with much success, "Its safety is a special recommendation."

Graves' description of hyperthyroidism, by a curious anachronism, has come to be his chief claim to immortality. Sir William Osler unearthed the paper of Parry and called attention to his priority. Stokes in a biography of Graves[8] recounted what he considered to be the latter's outstanding achievements, without mention of the description of hyperthyroidism. It was first published in a short-lived, rival issue, the Renshaw Edition, of the *London Medical and Surgical Journal.* A first edition of the original article is quite rare, no copy being found in the Library of the King's County Medical Society nor in the New York Academy of Medicine. It has, however, been reprinted in its entirety in the several English[11] and American[12] editions of his "Clinical Lectures." More recently, it appears in the book by R. H. Major.[13] To Major Edgar Erskine Hume, I am indebted for the following bibliographical data:[14]

Dear Sir:

In reference to the *London Medical and Surgical Journal,* 1835 Vol. VII: part 2, pages 516 and 517 (Renshaw Edition) in which appeared the "article in which Robert James Graves first described the disease which bears his name," the old series of this Journal was published from July 1828 to September 1829, edited by John Davies, John Epps and Joseph Houlton. This magazine was a continuation of the *London Medical Repository.* In Vol. 3, July 1829 Michael Ryan became Editor. The new series edited by Ryan and his associates was published as a weekly, two volumes annually, by Renshaw and Rush, February 5, 1832 to December 16, 1837, thirteen volumes. August 15, 1834 after issue of No. 133, dated August 16, 1834 the partnership between Dr. Ryan, the editor, and Renshaw, the publisher, was dissolved, and each continued the issue; dates and numbers being the same, forming vol. 6, 6a, 7, 7a; Pages 1–96, vol. 6 being the same in both sets. Renshaws' issue ceased July 25, 1835, No. 182; Dr. Ryan continued to December 1837 (vol. 12).

The volume containing the article in question in this library is of the Renshaw issue. It was published under the title of "Newly observed affection of the thyroid gland in females," as part of Dr. Graves' Clinical Lectures at the Meath Hospital during the session of 1834–1835, Lecture No. XII: pages 513–520, the part pertaining to the above appearing on pp. 516–517. This Lecture was printed in No. 173, Saturday, May 23, 1835.

Very truly yours,
Edgar Erskine Hume
Major U.S.A. Librarian.

Graves was tall, swarthy, with expressive features and a very distinguished manner. He had the remarkable power of attaching his friends to himself with the firmest bonds of loyalty. He is said to have been given somewhat to sarcasm, "mentally humble, but instinctively proud, he seldom spared the bad, the indirect or the presuming man." He was much in demand as a medical consultant although his practice was less lucrative than that of Sir Dominick Corrigan, his contemporary in Dublin: That Wm. Stokes owed much of his greatness to his friendship and association with Graves is quite evident, for the memoirs at the death of Stokes[9,15]

contain pages in eulogy of Graves. His wife was Anna, daughter of Rev. Wm. Grogan. He had two sons and four daughters; his descendents still live in county Armagh.[21]

Many of Graves' writings were devoted to things other than medical. He wrote on the "Hungarian Revolution" and the "War in Affghanistan," on the "Influence of the Waters of the Dead Sea and of the Great Salt Lake in America on Animal Life," "On the Hock Joint of the Horse" and on the "Birthdays of Celebrated Living Authors." Many unsigned articles in the newspapers of the day are said to have been written by Graves.

Dr. Stokes relates how Graves wrote his own epitaph in a facetious mood.

> He was, with me, going round the hospital, when we entered the convalescent ward. He began to expiate on the healthy appearance of those recovered from severe typhus. "This is all the effect of our good feeding," he said, "and lest when I am gone, you may be at a loss for an epitaph for me, let me give you one in three words: *He fed fevers.*"

The inscription which appears on his tomb in the Mount Jerome Cemetery is one which Graves wrote during his last illness, which he repeated before his death, requesting that it be his epitaph:

Robert James Graves.
Son of Richard Graves,
Professor of Divinity
Who,
after a Protracted and Painful Disease,
Died in the
Love of God and in the
Faith of Jesus Christ.
1797–1853.

A bust in marble, done by John Hogan was presented to the College of Physicians by his wife, shortly after his death. In 1877 funds were raised by subscription among Irish physicians for a statue of Graves to be placed in the College of Physicians. Mr. Albert Bruce Joy, a young Irish sculptor was commissioned to execute the statue and Dr. James Foulis Duncan spoke at the unveiling. I shall borrow his closing words,[5] spoken on that occasion, to conclude this biography:

> . . . These statues, though silent, will act as monitors and in imagination seem to say—"Work as we worked, live as we lived, strive as we have striven and you will achieve success in life, and your names will be honored after death."

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BOOK REVIEWS

A Brief Outline of Modern Treatment of Fractures. By H. Waldo Spiers, M.D. Balt., William Wood & Co., 1935.

Illustrated with over 100 line cuts, this little volume of 128 pages gives the fundamentals of modern treatment of fractures in a direct and didactic manner. Little fault will be found with the contents of this volume although practically every reader will find omission of some of his own pet ideas.

A Short Practice of Surgery. By Hamilton Bailey, F.R.C.S., and R. J. McNeill Love, M.S., F.R.C.S. Ed. 2, London, H. K. Lewis & Co. Ltd., 1935.

A second edition of this volume has been called for within two years which is an indication that it has proved its value. True to its title, "A Short Practice of Surgery," it is concise as well as short. Less important items have been put in small type so that a great deal of information is included in its almost 1000 pages. There are 700 illustrations including quite a number in color. These are better than are usually found in books of this kind and all in all, the book may be recommended as a handy volume for quick reference.

Bee Venom Therapy. Bee Venom, Its Nature and Its Effect on Arthritic and Rheumatoid Conditions. By Bodog F. Beck, M.D. N. Y., D. Appleton-Century Co., Inc., 1935.

A volume of over 200 pages on the subject is enough to make any conscientious reviewer quake. The author, however, takes away the sting (no pun intended) by such frank statements as: "The subject-matter . . . is rather difficult and complex. . . . The subject is still in an experimental and consequently in a controversial stage. . . . To invite and secure the cooperation of the medical profession in clearing many enigmatical features was one of the considerations which prompted me to publish the present volume."

The author presents the historical aspect and cites cases. The bibliographies which follow each of the fourteen chapters are repeated at the end in a composite bibliography of eleven pages.

To attempt to review this book in the space of a short review is impossible. A strange subject is presented in an interesting manner. The suggestion that bee venom therapy is of help and value in arthritic and rheumatoid conditions is interesting. Those experienced with these diseases will of course be anxious to know of this or any other therapy that offers any real help. The book is sure to arouse considerable curiosity and it is too be hoped that benefit may be derived from this treatment.

The book is announced as the first monograph on bee venom therapy to appear either here or abroad. It remains to be seen whether or not it will be the last.

Practical Endocrinology. Symptoms and Treatment. By Max A. Goldzieher, M.D. Illus. N. Y., D. Appleton-Century Co., Inc., 1935.

A book of this size has been needed to present the status of this complex and ever-changing subject. The author is conservative in his viewpoints which is refreshing in view of the over-enthusiasm of so many writers on this subject. There is no question but that we are a long way from the last word on this subject but for a present-day viewpoint, this book will answer the needs of the average physician.

Poliomyelitis. A Handbook for Physicians and Medical Students. By John F. Landon, M.D., and Lawrence W. Smith, M.D. With a section on the orthopedic after care of the disease by Garry DeN. Hough, Jr. N. Y., Macmillan Co., 1934.

Here is a thorough treatise on poliomyelitis based on a study of the 1931 epidemic in New York City. To those interested in this disease, this book will be a valuable work of reference. The pathology, epidemiology, symptomatology, diagnosis and treatment are concisely yet thoroughly covered. This volume is an outstanding monograph of the type of which more are needed.